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SPRECKELS

SUGAR BEET

BULLETIN

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AGRICULTURAL DEPARTMENT—SPRECKELS SUGAR COMPANY

Addresses and Telephone Numbers

SAN FRANCISCO STAFF

NAME	TITLE	ADDRESS	TELEPHONE
Guy D. Manuel	*Vice-Pres. & Gen. Agriculturist*	**SAN FRANCISCO** *2 Pine Street*	*DOuglas 2-5600*
Hugh F. Melvin	*Agricultural Manager*	“ “	“ “
John M. Kendrick	*Assistant Agricultural Manager*	“ “	“ “

SPECIAL SERVICES STAFF

Dr. Russell T. Johnson	*Director of Agricultural Research*	**SPRECKELS**	*GLenview 5-1811*
Dr. Varon Jensen	*Plant Physiologist*	“	“ “
George W. Wheatley	*Agronomist*	“	“ “
Austin A. Armer	*Agricultural Engineer*	**WOODLAND**	*MOhawk 2-3261*
Jack Brickey	*Agronomist*	“	“ “
Lauren Burtch	*Agronomist*	**FRESNO 5** *715 W. Fountain Way*	*BAldwin 2-0017*
S. L. Stovall	*Livestock Specialist*	**SAN FRANCISCO** *2 Pine Street*	*DOuglas 2-5600*

DISTRICT 1 STAFF

Walter Buckingham	*District Manager*	**SPRECKELS**	*GLenview 5-1811*
J. Byron Larsen	*Agricultural Superintendent*	“	“ “
Jay N. Hill	*Field Superintendent*	“	“ “
Vernon D. Sherwood	*Field Superintendent*	“	“ “
Harold H. Voth	*Field Superintendent*	“	“ “
Tom F. Ryan	*District Engineer*	“	“ “
James E. Gardner	*Field Superintendent*	**KING CITY**	*King City 602-M*
Arthur C. Young, Jr.	*Field Superintendent*	“	“ “ *673*

DISTRICT 2 STAFF

Ralph S. Lambdin	*Distrit Manager*	**MANTECA**	*TAlbot 3-3121*
S. S. Anderson	*Agricultural Superintendent*	“	“ “
Joseph W. Hull	*Field Superintendent*	“	“ “
Virgil Horton	*Field Superintendent*	“	“ “
Gene A. Wilkinson	*Assistant Field Superintendent*	“	“ “
Ernest Moeller	*Field Superintendent*	**PATTERSON** *P. O. Box 928*	*TYler 2-2711*
John W. Bryan	*Field Superintendent*	**WALNUT GROVE** *P. O. Box 35*	*Walnut Grove* *SPring 6-3371*
William Hurley	*Field Superintendent*	**LOS BANOS** *P. O. Box 928*	*Los Banos 4182*
Stanley D. Bayer	*Field Superintendent*	**FIREBAUGH** *P. O. Box 998*	*Fresno* *BAldwin 9-3254*
J. Norman Dawe	*Field Superintendent*	**HANFORD** *P. O. Box 2043*	*LUdlow 4-3473*
R. Bruce Duncan	*Agricultural Superintendent*	**BAKERSFIELD** *431 Kentucky Street*	*FAirview 4-4904*
Martin Chernek, Jr.	*Field Superintendent*	“ “	“ “

DISTRICT 3 STAFF

Dan L. Dieter	*District Manager*	**WOODLAND**	*MOhawk 2-3261*
Donald R. Hefner	*Agricultural Superintendent*	“	“ “
William Duckworth	*Field Superintendent*	“	“ “
William Hodson	*Field Superintendent*	“	“ “
W. B. Marcum	*Field Superintendent*	“	“ “
J. G. Maurer	*Field Superintendent*	“	“ “
John R. McDougall	*Field Superintendent*	“	“ “
Charles M. Carlson	*Field Superintendent*	“	“ “
Michael Daugherty	*Assistant Field Superintendent*	“	“ “
John O. Nielsen	*District Engineer*	“	“ “

SPRECKELS SUGAR BEET BULLETIN

Austin A. Armer	*Editor*	**WOODLAND**	*MOhawk 2-3261*

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

SPRECKELS SUGAR BEET BULLETIN

VOL. 25 JANUARY-FEBRUARY, 1961 NO. 1

BIGGER AND BETTER BEETS

Mean bigger yields and better beet quality. Better quality includes

HIGHER SUGAR

and

HIGHER PURITY

Research is aimed at both—and growers can do much to help. See page 2.

HIGHER QUALITY SUGAR BEETS

By Dr. VARON JENSEN
Plant Physiologist
Spreckels Sugar Company

THE SPRECKELS SUGAR COMPANY sugar beet contract for 1961 states, in part, that "Company reserves the right to reject beets testing below 12% sugar or 80% purity." The reason for this statement is a very real one; the cost of extraction exceeds the value of the sugar recovered when beets contain less than 12% sugar, or test less than 80% purity.

This statement establishes a fact of genuine concern to the beet grower—a fact which can guide his cultural practices in the direction of increased profits associated with higher sugar beet quality.

WHAT IS SUGAR BEET QUALITY?

Beet quality is defined in terms of two analytical values obtained in the laboratory. The first value is sucrose content itself, which is the percentage of the weight of the beet root which is sugar. The other term is beet purity. This is the percentage of the total water-soluble solid contents of the beet root which is sugar. This latter value is of interest mainly to processors, because it is a measure of the facility with which the sugar in the beet can be extracted. The two component properties of beet quality described above have been found to be interdependent. That is, beet roots which contain high percentages of sugar generally have high purity also. Conversely, beets with low sugar content frequently have low purity.

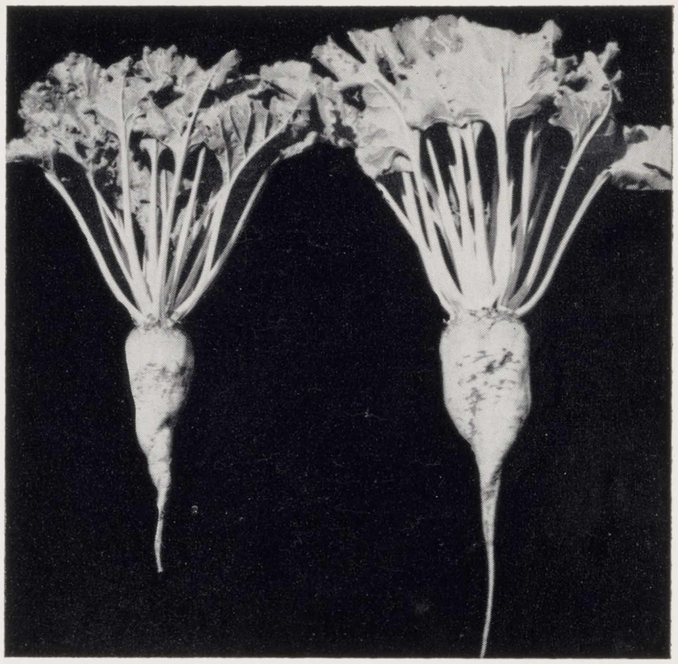
From the grower's standpoint, sugar content (% sugar, as stamped on his analysis tickets) is a measure of *both* sugar content and purity, since high purity is almost invariably associated with high sugar percentage. The sugar percentages stamped on the analysis tickets, when averaged over several acres of beet deliveries, becomes an important measure of crop success, because they tell:

1. That the higher the % sugar, the greater the value of each ton of beets.
2. That the higher the % sugar, the more efficient becomes factory operation.

CAN SUGAR CONTENT BE INCREASED?

With the aim of increased sugar content as our goal, what are the methods of attack available to us? The two gross variables which we may manipulate as we pursue our goal are: (1) the plant itself, and (2) the environment in which the plant is grown.

Efforts of geneticists and plant breeders to alter the genetic constitution of the sugar beet plant have been rewarded with significant success. Characteristics such as large root size, disease resistance and bolting resistance have been incorporated into the sugar beet. Also, vigorous hybrid varieties with higher sugar content have been made available for commercial use in the recent past. Data from variety trials located in widely scattered beet production areas of the State have provided striking examples of the greater production potential which hybrid plants possess as compared to open pollinated varieties which have served us so well over the years. Such contributions are part of a continuing effort by geneticists to attain the goal of high yield combined with high sugar content. Comprehensive programs of variety improvement are carried out each year in the continual search for superior plant varieties.



2

BIGGER AND BETTER BEETS are being created by the plant scientists. Hybrid varieties give increased tonnage—but more important, they have higher sugar and higher purity.

Now, what can be done to better adapt the immediate environment to the needs of the sugar beet crop? This is the realm of the crop manager, for he faces the challenge of suiting the environmental complex of his own fields to the needs of the crop he is culturing. Certainly, this is no simple task, because environment is composed of so many variables. But some things the manager can do are:

1. Irrigate the soil to vary the moisture conditions of the environment.
2. Vary the nutrient status of the soil by cropping and fertilization.
3. Manipulate plant competition by weed control practices and stand reduction.
4. Influence the exposure of plants to disease and insect vectors by utilizing pest control measures.
5. Deliver beets free from weeds *and properly topped.*

Item 5 must be emphasized—the quantity of unwanted soluble salts in a few petioles, leaves and the crown may equal or exceed those in the beet root itself. *Proper topping is a major factor in upgrading beet quality.*

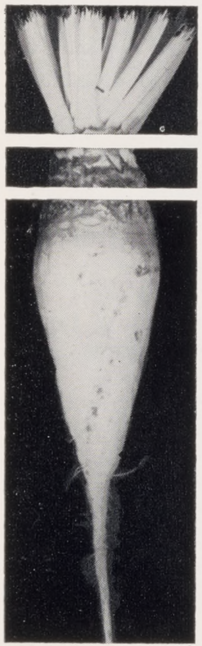
A general statement may be of assistance to the sugar beet crop manager. In order to obtain maximum production from the beet crop, the plants should be maintained in an actively growing condition from the time the seedlings emerge until the crop is harvested and delivered. To amplify, we may state that whenever plants are placed under stress for nutrients, for water, or for light intensity and quality, capability for maximum return in tonnage or sugar content is reduced. Practically, then, the crop manager needs to

3

THE BEET GROWER contributes to higher sugar and higher purity by creating the best possible growing environment. Every step from land preparation to harvest can help build quality.

make up deficiencies in appropriate quantities at the proper time.

Let us consider the example of nitrogen nutrition of the sugar beet crop to illustrate the points made above. Beet plants grown under high nitrogen nutrition may produce large storage roots, but concentration of sugar within such roots will be low. Conversely, if the soil supplies an insufficient amount of nitrogen for optimum growth in the early months of the growing season, then the storage root may well contain a high concentration of sugar, but root size will be small. Payments made to California beet growers are based on the concentration of sugar in the roots, as well as the beet tonnage delivered to the processor. Therefore, it is important that the nitrogen nutrition program of a grower should be geared to the production of both a high tonnage of roots and a high concentration of sugar in the roots.



4

	SUGAR	PURITY
PETIOLES	0.9%	25%
CROWN	10%	70%
ROOT	15%	85%

ROOTS ALONE have sugar and purity in the profitable range for both grower and processor.

Crowns, when present as a result of inadequate topping, tend to reduce quality.

But Petioles—even a few—may reduce quality more than all the best cultural practices can increase it.

HOW MUCH NITROGEN?

To recommend an optimum nitrogen fertilizer program for even a small production district would be folly. Soil types—just one factor of the environment—vary so widely that specific recommendations are needed for fields or portions of fields rather than for various larger areas of production.

A grower has the following sources of information available to guide him in a fertility program:

1. A study of the characteristics of the soil series present on the ranch. This will help considerably in assessing the native fertility of the soil. Soil analyses are very helpful in this regard, particularly, when the soil mass is sampled adequately.
2. A study of the cropping history and fertilizer application practice. These will allow the grower to estimate how much nitrogen has built up in the soil profile as a result of long-term cultural practices.
3. The requirements of the current crop. It has been estimated that when a 20-ton crop of beets (roots plus tops) is removed from the soil, the equivalent of 80 pounds of soil nitrogen is removed. Now, with an estimate of both the nitrogen status of the soil at the time of planting and of the approximate needs of the crop to be grown, we are in a position to appraise the need for additional nitrogen application for the current season.

Extreme care should be taken to avoid overestimation of need. This would result in excessive application of nitrogen and a depression of sugar content at harvest time. If nitrogen supply in the soil is insufficient to supply the needs of the crop until harvest, this problem can be alleviated by additional side-dressings of fertilizer, *so long as the crop has ample opportunity to utilize the added nitrogen completely before harvest.* Researchers, who have worked extensively with sugar beet fertilization problems, have established a general rule: the beet foliage should show signs of nitrogen depletion in the soil (border-effect in the field; pale green leaves and thin growth) for about four to six weeks before the intended harvest date.

It has been demonstrated that, if nitrogen or other environmental factors have not been growth limiting through the season, then root size would normally be satisfactory six weeks before harvest. As soil nitrogen becomes depleted and pressure for vegetative growth of the beet diminishes, then further growth of the beet crop would take the form of continued sugar synthesis in the leaves and further storage of sugar in the roots.

It is of course impossible to establish a replicated fertilizer trial in every beet field of the State, even though the results would be invaluable as a management guide. A method has been devised, however, to give the grower specific information concerning the immediate needs of a beet crop for nitrogen fertilization. This method has been used widely in the State with encouraging results. The procedure consists of establishing within a field adjacent parallel strips of beets which receive different levels of nitrogen fertilization. The aim of the selection of the levels of fertilization included is to bracket the optimum nitrogen application for the specific field. If a soil of high native fertility is present in the field, one strip should receive no commercial nitrogen whatsoever.

Individual strips should be at least four beds wide and then observations should be made within the center two beds. Diagram 1 has been prepared as an illustration of strip applications of nitrogen fertilizer incorporated into a beet field.

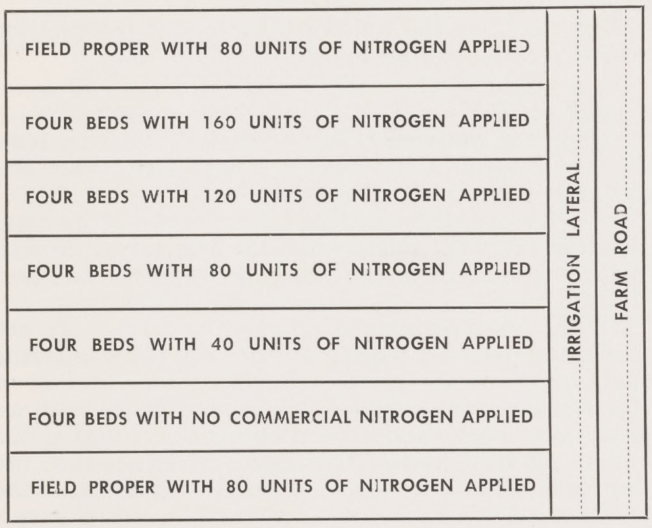

FIELD PROPER WITH 80 UNITS OF NITROGEN APPLIED
FOUR BEDS WITH 160 UNITS OF NITROGEN APPLIED
FOUR BEDS WITH 120 UNITS OF NITROGEN APPLIED
FOUR BEDS WITH 80 UNITS OF NITROGEN APPLIED
FOUR BEDS WITH 40 UNITS OF NITROGEN APPLIED
FOUR BEDS WITH NO COMMERCIAL NITROGEN APPLIED
FIELD PROPER WITH 80 UNITS OF NITROGEN APPLIED
IRRIGATION LATERAL
FARM ROAD

DIAGRAM 1, Illustrating the layout of a portion of a sugar beet field to provide comparisons of plant response to different nitrogen rates.

ADVANTAGES OF STRIP TRIALS

The method outlined has these distinct advantages:

1. It is a functional method which may be used by every beet grower.

2. No intensive analysis of data is required. Observations may be made by the grower himself and the results can be interpreted in the light of the grower's own experience. Spreckels field superintendents will assist in the observation and evaluation of the experiment.

3. Observed results apply immediately to the field in which the strips are established. Therefore, if the body of the field had received 80 units of nitrogen, (see diagram 1), and if the 40 unit strip shows definite signs of nitrogen deficiency early in the growing season, then the grower can assume that the body of the field will show nitrogen deficiency within 3 or 4 weeks. With this information available, it may be advisable to immediately sidedress an additional 40 to 60 units of nitrogen into the body of the field.

4. With the help of the Spreckels field staff, growth behavior of the beets within the several strips can be followed. Tests of the sugar content of the beets may be conducted late in the growing season. Also, the

(Continued on page 8)

A REVIEW OF THE 1960 CROP

By G. D. MANUEL

Vice President and General Agriculturist,
Spreckels Sugar Company

UNDER THE AGRICULTURAL conditions existing in California, one sugar beet season overlaps the next, so that we often lose sight of the results of one particular crop. With the 1961 crop now rapidly being planted, it is easy to forget the 1960 crop. But a short review of this crop is in order.

The planting and thinning of the 1960 crop was timely and, in the majority of cases, carried out under ideal conditions. While 1959 produced a record crop for the state, one could easily predict a better one for 1960 by early comparisons. However, adversity began to hit the crop about the end of May. Extremely high temperatures with warm nights caught the crop just as it was in its most rapid growth. Tender leaves dried up, and as water was applied to the crop during June and July, successive hot spells continued to take their toll of young leaves.

Growth studies, conducted by our agricultural research staff, showed that beet root development was very slow and, in some cases, even non-existent during June and July—normally the months of rapid development. As the beets struggled to maintain themselves and force out new leaves, they used up their stored sugars. When harvest started in August, sugars were so low that growers were reluctant to harvest.

In the coastal areas these conditions were not as critical because the temperatures did not reach the peaks of those in the central valleys. Yields were good, and although sugar contents were low to begin with, they reversed a long-time trend and actually increased through the season, instead of gradually falling off. Yields did not equal the records of 1959, but were second only to that year, so growers could be well pleased with their crops.

In the central valleys the beets were starting new growth in August and September, so were increasing in tonnage, but storing little sugar. In October, we began to see some improvement in sugar except in crops hard hit with virus, sclerotium, or other diseases. By November, it began to appear that the balance of the crop might approach normal sugars and quality. However, rain shut off the harvest early in the month and it was feared that a large percentage of our beets would have to be carried over to spring.

Rainfall stopped shortly after this early start, and it was hoped that a full scale harvest could be resumed. Fog over much of the valley allowed little drying, so beets were brought in at slow rates. The lack of sunshine and the extreme cold kept the beets from development. The quality actually deteriorated during December and the first part of January, so that harvest was eventually terminated. While these conditions were far from ideal, enough beets were sliced to ease the problems of our forthcoming spring campaign. This spring harvest, while the largest in tonnage to date, should be handled in from 40 to 50 days.

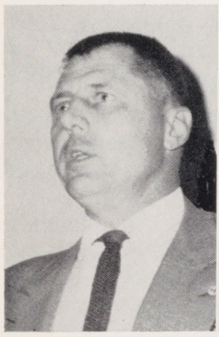
(Continued on page 8)

BEET QUALITY STRESSED IN INDUSTRY MEETINGS

EACH YEAR the Beet Sugar Industry and its processor personnel meet to discuss the problems of the industry and to offer solutions. This year was unique in one respect—the three California meetings brought into sharp focus the importance of sugar beet quality as a factor in producing beet sugar at a profit to both growers and processors.

SPRECKELS AGRICULTURAL STAFF MEETING

The annual meeting of the Spreckels Sugar Company Agricultural Department was held at Palo Alto, from January 31 to February 3. A day was devoted to presentations by agricultural specialists from various agencies who graciously took time from their duties to attend the Staff meeting. The guest speaker at the concluding dinner meeting was Mr. J. Earl Coke, Vice President, Bank of America, and formerly Vice President and General Agriculturist of Spreckels Sugar Company.


LEON V. TICHENEN
Farm Advisor,
Santa Clara County

DR. W. HARRY LANGE
Entomologist,
U. of C., Davis

5

DR. C. O. McCORKLE
Economist,
U. of C., Davis

DR. ELI BRANDES
Economist, Stanford
Research Institute

OTHO W. FILLERUP
Calif. Council of
Growers

6

J. EARL COKE
Vice President,
Bank of America

Another full day's program was presented by the Spreckels agricultural staff specialists, each of whom reported on a phase of the coordinated agricultural research program. It was notable that each specialist reported on his contribution to the study of sugar beet quality and means for improving sugar content and purity, while still retaining high yields.

Dr. Russell T. Johnson conducted this session, which covered the subjects of variety improvement, fertilizer and irrigation practices, planting and harvest dates, and the control of diseases and pests.

The staff made a field trip to the U. S. Army Corps of Engineers facility at Sausalito, which included a demonstration of the San Francisco Bay Model. This is the basis of tide and current studies which will determine many aspects of future flood control and water conservation works within the State.

Concluding talks were given by Spreckels president, Charles de Bretteville and officers of the company.

TECHNOLOGISTS MEET

The 1961 Biennial Conference of the California Sugar Beet Technologists was held at Monterey, February 3 and 4.

Agricultural and Factory subjects were presented in separate sections on the first day, and joint sessions for both groups occupied the second day. Spreckels Agricultural Department members who presented papers were Dr. Russell T. Johnson, Dr. Varon Jensen and Austin Armer. George W. Miles, Spreckels Factory Superintendent, was in charge of general arrangements.

BEET SUGAR DEVELOPMENT FOUNDATION

This organization has for its membership the beet sugar processing companies of the United States. Its function is to guide and coordinate all research and development relating to sugar beet and beet sugar production, whether conducted by member companies, Federal or State agencies. Its president is Guy D. Manuel of Spreckels Sugar Company.

An entire day of this three day meeting (held at Monterey, Feb. 7, 8 and 9) involved a discussion of beet quality. Dr. Russell T. Johnson was chairman.

Another day's discussions focused on the subjects of seed, planting, thinning and weed control. Austin Armer led a panel discussion on chemical and mechanical approaches to the thinning and weed control problems, including the new field of breeding varieties tolerant to herbicides.

7

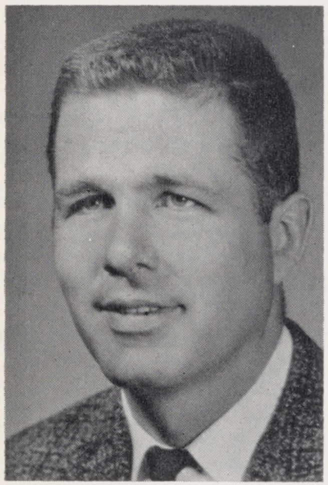
ALL MEMBERS of the Spreckels Agricultural Department met at Palo Alto, January 31-February 3.

SPRECKELS AGRICULTURAL RESEARCH PROGRAM EXPANDED

SPRECKELS AGRICULTURAL RESEARCH is dedicated to the continuing accumulation of information relating to sugar beet agriculture. Because the successful growing of sugar beets involves different problems in different parts of California, the research program covers an ever widening geographical area.

To accommodate this growth, two important staff changes have been made. First, Lauren M. Burtch, Agronomist, has been transferred from Woodland to Fresno. Here he will specialize in field studies relating to sugar beet quality as it is affected by nutrition, irrigation and disease factors.

Second, the position of Agronomist at Woodland has been filled by the appointment of Mr. Jack Brickey. His work will emphasize the study of weed and disease factors.



8

Mr. Brickey graduated from the University of California at Davis in 1955 with a B.S. degree in Agronomy. After two years of military service, he continued his studies under the guidance of Dr. R. S. Loomis, and received his M.S. degree in Agronomy. His research studies included the effects of various nitrogen sources of sugar beet growth.

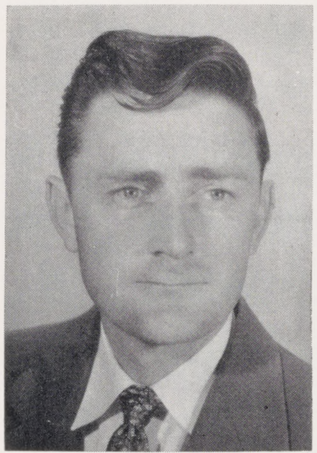
Following his graduate studies Mr. Brickey joined the management staff of Newhall Land and Farming Company. He enriched his field experience with sugar beets in the Santa Maria and Firebaugh areas, and brings to Spreckels a valuable background in sugar beet culture and production.

Notes from Our Field Men

Field Superintendents report items of unusual interest so that others on the agricultural staff will have the benefit of their findings.

Spring harvest is only one month away—these notes on harvest may be of interest to growers.

JOHN McDOUGALL, WOODLAND



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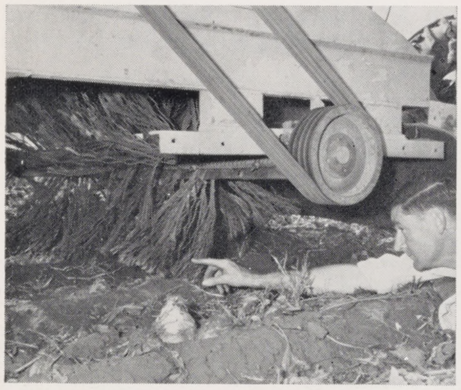
In an effort to clean up deliveries from the conventional rubber-flailed topping devices and also to cut the excessive cost of rubber flail replacements, I devised a roto-beater unit with steel cable flails instead of rubber.

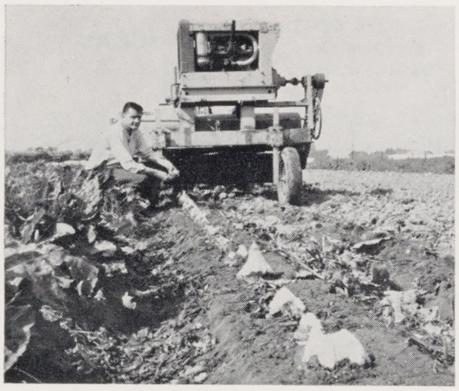
A once-over trial gave a better job than twice-over with rubber-flailed equipment. Twice-over lightly did an excellent job, with very few beets dislodged from the row, which is quite often the case with the rubber type beaters.

Using this cable beater once following a Brady type chopper also did an excellent job of top removal. Ground speed was about 3½ or 4 miles per hour.

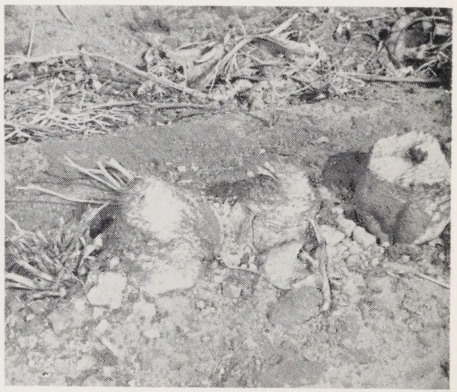
My hope was that the steel flails would be much more resistant to breakage and wear than rubber flails. After using the beater over 30 acres of beets, there was no breakage of flails, but there was considerable wear on the cables directly over the beet row. With a few modifications and experimenting with different types of cable, I think this problem can be solved. The "often sought" but "never found" once-over topping job may become a happy reality.



AUTHOR and wire brush.



Twice over.



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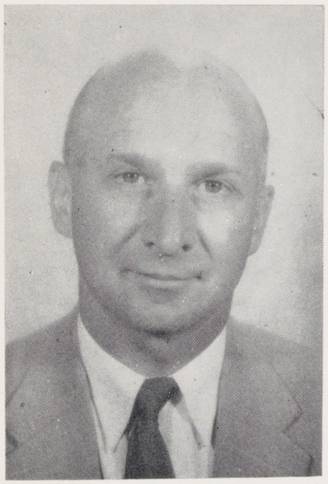
Once over.

W. B. MARCUM, WOODLAND

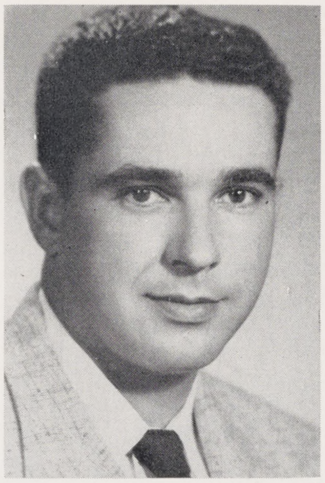


Rudy Howald, a sugar beet grower in the Woodland area, has constructed a three-row self-propelled beet harvester which works on the same principle as the Gemco harvester. There are three pairs of pickup wheels on 28 inch centers; cleaning rollers and elevator are all mounted in front of the operator. The machine is powered with a Huff loader engine rated at 66 horse-power. The ingenuity of both the grower and his mechanic, Everett Washburn, has produced a machine with which two men can consistently harvest 180 to 200 tons per day. Under delivery quotas, the two men do the entire harvest; roto-beating twice, digging, loading two trucks and delivering them to the receiving station. The quality of the beets delivered not only reflects the good operation of the machine, but also the close supervision which is given the entire operation by both the grower and his operator.

This supervision includes a twice-over top-beating operation with a rotary beater which was also designed by Rudy Howald. Careful attention to flail maintenance and adjustment results in the delivery of 90.9% clean beets.

Several of the operating features of this machine will be changed before next year's harvest. First, the turning radius of the harvester will be shortened to permit easier turning at the ends of the field. Second, power will be increased by replacing the engine with a 110 or 120 horse-power engine. Third, the elevator will be moved toward the center of the machine for better balance, and a short elevator unloading into a hopper will be added.

STANLEY BAYER, FIREBAUGH



12

Clean harvest has always been a problem in the Cromir District, primarily due to a high weed population. Thus the problem of delivering clean beets passes to the beet harvesting operator. Although many modifications of harvesters and the use of shredding equipment have been tried, only a few are worth mentioning.

One of the finest pieces of equipment I have seen as an aid to harvesting weedy fields is a rotary forage chopper operating just ahead of the beet harvester. This removes all top growth and deposits it on land that has become dry. This allows the cleaning devices on the harvester to work entirely on material originating from below the surface.

On the two row harvester the suspending of chains or rubber belting over the kicker rolls and/or the installation of grab rolls in place of kickers will remove up to 25% more trash.

There are some modifications to the Marbeet Midget that have greatly reduced time and trash in the truck. The simplest is the installation of a smaller pulley on the elevator. This will cause the elevator to run at a greater speed and deposit material against the rear of the cart with such force that most clods will break up and fall through the chain.

One harvester operator in the Kerman district installed a small weed burner and butane tank on the cart of his Midget, directing the flame at the adjacent row. This works very well on dry weeds and cuts down time. The cost of butane ran around $3.00 per day.

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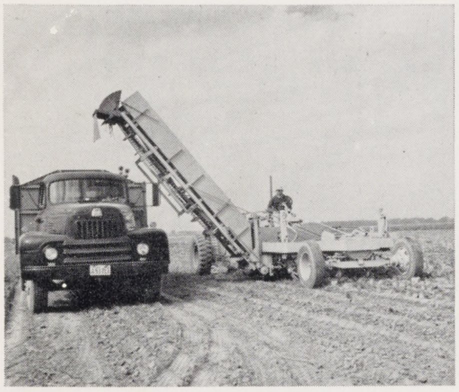
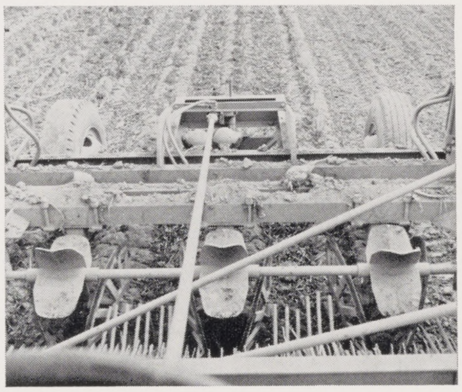
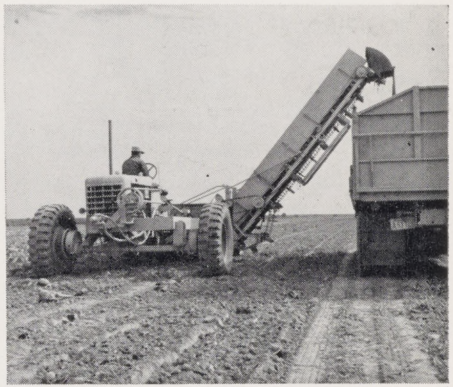


The Howald Digger



Driver's View



13

Rear View

STANLEY BAYER, FIREBAUGH

(Continued from page 7)

Another modification on a Midget that has worked very well is the transfer of the coulters from the frame to the forward portion of the trash belt frame. This allows more space for trash to pass the spike wheel and reduces time considerably.

Of course no modification will compensate for a machine that is worn or poorly adjusted. All growers should take steps to insure proper settings whether it be their own harvester or a commercial operator's.

HIGHER QUALITY

(Continued from page 4)

strips may be harvested independently and a comparison made of respective tonnages, as well as sugar contents. While the data which result from the program outlined may not be admitted to critical analysis, management decisions can be made much more appropriately with the aid of this information.

In summary, let us agree that we cannot be satisfied with the past production behavior of the sugar beet in California. We can expect that continuing efforts in research will build greater production potential into the sugar beet plant. Such improvement can be expected from both the release of better beet varieties and the establishment of improved management practices.

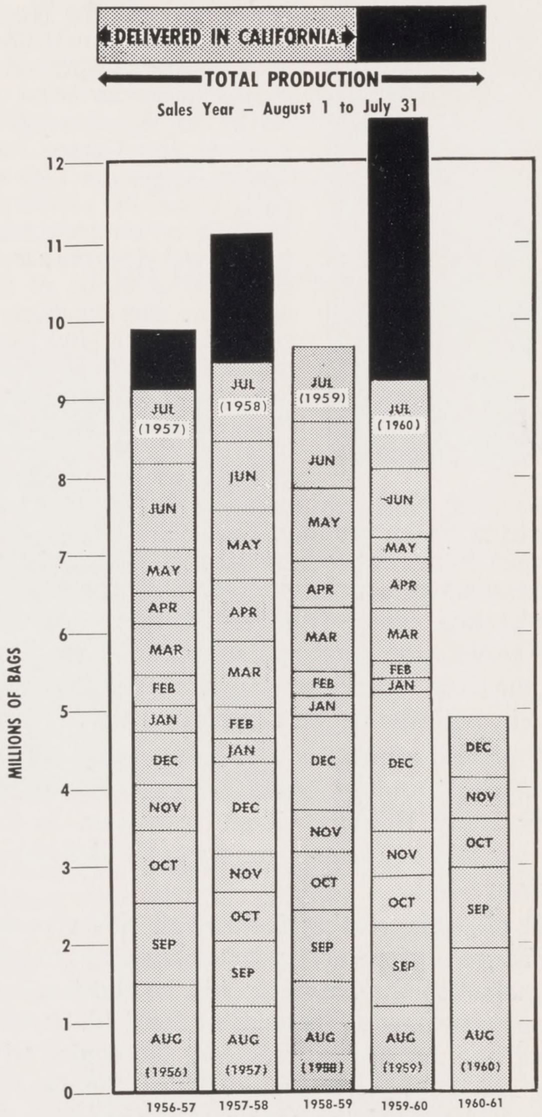
Finally, the grower can substantially improve the quality of his beet crop and his net return by a critical examination of present management practices. The nitrogen fertility program of every grower merits special attention because of the profound influence which nitrogen has upon root size, and in particular, on sugar content. By tailoring the environment to the actual needs of the crop, net returns to the grower will be maximized—especially when sugar content can be kept high by proper removal of crowns and petioles, which contribute negligible sugar, and which actually contribute serious amounts of non-sugar impurities.

1960 CROP

(Continued from page 4)

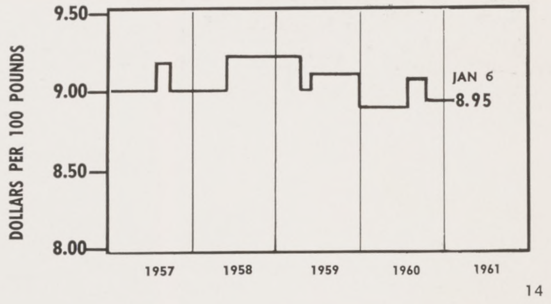
This review of the 1960 crop highlights the fact that the growing conditions after the middle of May were some of the poorest we have experienced in many years. While we cannot do much about the weather, it is interesting to note that there were some excellent crops grown in 1960. Good farming practices, in our opinion, are more important during a poor year like 1960 than in an ideal year. Thus, to grow successful beet crops every year, one must pay closer attention to good cultural practices. This is the only method we know to minimize adverse weather conditions. Growers who kept their crops in top condition again had a profitable season in 1960.

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



The **SPRECKELS SUGAR BEET BULLETIN** is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
Mention of specific methods, devices and implements does not constitute an endorsement by the Company.
All photographs by the editor unless otherwise indicated.

AUSTIN ARMER, EDITOR
SPRECKELS SUGAR COMPANY
WOODLAND, CALIFORNIA

MY 9 '61

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SPRECKELS SUGAR BEET BULLETIN

VOL. 25 MARCH-APRIL 1961 NO. 2

15

A WEAK LINK

in the chain of operations can defeat a spring mechanization program.

LAND PREPARATION
WEED CONTROL
PLANTING
THINNING
CULTIVATION

are links in the mechanized crop production chain.

YOLO COUNTY SUCCESS STORY

By JOHN McDOUGALL
Field Superintendent
Spreckels Sugar Company

WE HAVE SEEN many assaults on the problem of mechanizing sugar beet thinning in Western Yolo County over the past ten years. But it took a critical labor problem and a mechanically minded farmer to make the first major breakthrough.

The few growers who had attempted spring mechanization in the past had varying degrees of success, due mainly to their reluctance to take out enough beets. As a result their hand labor costs were equal to or (in some cases) more than their neighbors' who made no attempt at mechanization.

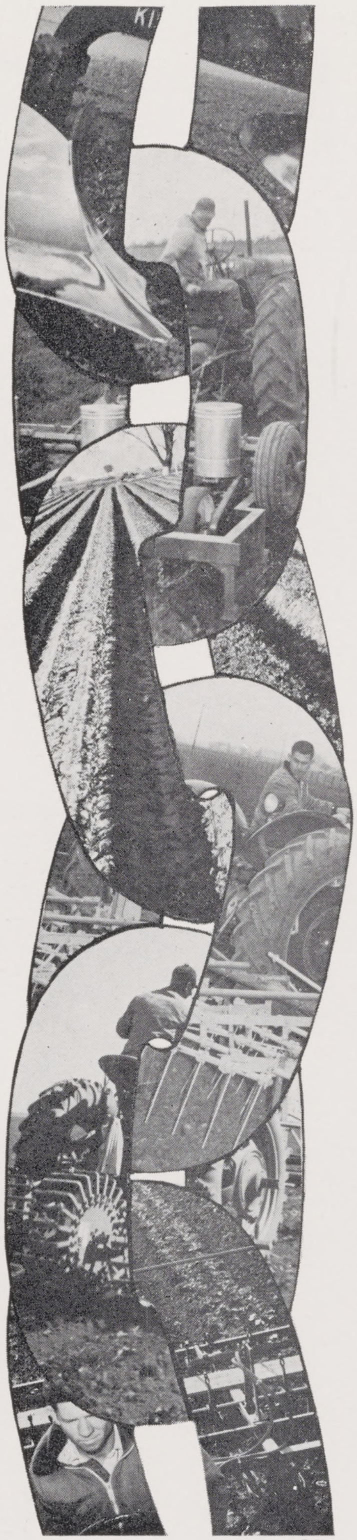
The particular field in question was early-planted. Heavy spring rains had kept the cultivators as well as the hand labor out of the field. The beets and weeds were about 10 to 12 inches high and labor costs were running up to $60.00 per acre for thinning.

Meek & LeMaitre were the operators of this farm. Jack Meek called me and wanted to know if I could possibly help him. A few seasons before, I had a similar weedy field in which we had roto-beaten the beets and weeds to almost ground level, and then hand thinned at regular piece-work rates. The yield on this field was evidently not injured by this practice, so I induced Jack Meek to try this operation.

I TALKED HIM INTO IT

Jack had been so disgusted with his $60.00 hand labor cost that I felt he was a prime target for complete mechanization. So upon my suggestion he immediately purchased a Eversman Thinner and we went to work.

We roto-cycled everything in the field—weeds and beets—down to about two inches high. Then we started the thinner. It took us a considerable amount of time to adjust the thinner down to where there was a stand somewhere between what Jack thought should be left and what I thought would be an ample stand. After working most of the day with Jack on the thinner I left him to his own devices. At approximately 9 p.m. that evening I received a call from Jack. He told me that the thinner had wiped out the field; that mechanization was out, and could I meet him at 6:30 the next morning. When I arrived at the field, Mr. Meek was all smiles. The remaining beets had revived during the night and there was an excellent stand.



16

EACH OPERATION in a spring mechanization program is linked to every other operation.

The success of complete spring mechanization can be assured only if every operation is planned beforehand and proper equipment provided for use at the right time.

Upon seeing this and realizing how *rough* they could treat their beets and still make a stand, Meek & LeMaitre continued to do every one of their fields (more than 500 acres) with the thinner. They were more than satisfied with the results. But this apparent success does not end the story.

PLANNING FOR SPRING MECHANIZATION

Meek & LeMaitre could see that the future for hand labor was bleak. Since their first attempt at mechanization was such a success, they wanted more.

One of the things they wanted to use was chemical weed control. We tried Endothal and found that it apparently leached from the seed rows to the center of the double row bed. Thus we got excellent weed control, but in the center of the bed, where no beets grew. About this time there was also considerable activity in the development of a sled type cultivator. This could cultivate 60 to 100 acres of beets per day. In order to make best use of chemicals for weed control, and to get the proper chemical placement, single row bed planting seemed to be the answer.

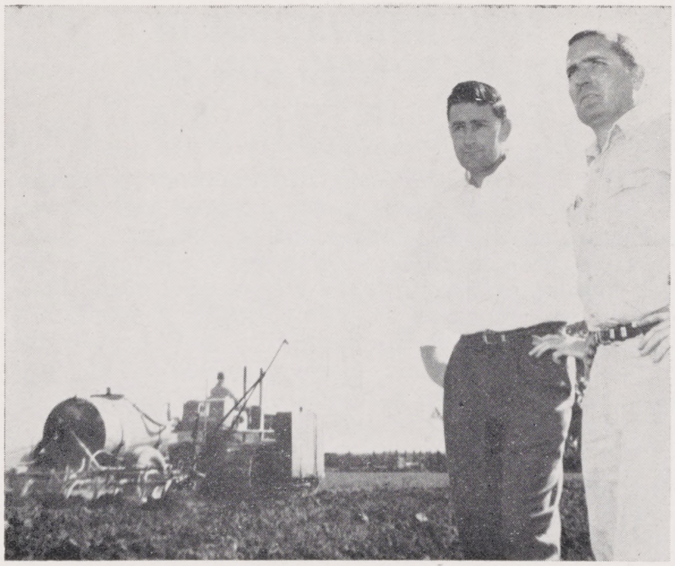
Not only would chemical weed control be better, but also high stand counts (ranging from 120 to 200 beets per 100 ft. of row) on these wide 30" rows would still yield beets of marketable size. (Heavy population on the double rows would cause a yield depression resulting from many small-sized beets.)

Upon selecting the 30" rows, Meek & LeMaitre built a 6 row planter-cultivator sled. One man planted, cultivated, and mechanically thinned the entire five hundred acres last season. In the past he had used as many as four cultivator tractors to do the same job.

They left strips in some of these fields that were not hand trimmed following mechanical thinning. In all cases where weeds were not a factor, yields were every bit as good in the untrimmed strips as in the trimmed.

A CHAIN WITH MANY LINKS

It became evident that thinning alone was not the solution to successful spring mechanization. It is a case of combining chemical and mechanical weed control with stand reduction. To build this chain of operations, Meek & LeMaitre have equipped their lister-ridger with two 300 gallon tanks to apply 5 lbs. of En-



17

JACK MEEK (right) and John McDougall are observing the work of the fertilizer-lister which also applies Endothal to the beds.

dothal in 10 to 20 gallons of water per acre. This is applied simultaneously with the preplant aqua ammonia and controls early water grass. In addition to this, they have purchased a spring-tine harrow to complete their attack on the weed problem. It is their ambition to be completely mechanized, and not to rely in any way on a labor supply which is unpredictable in cost, competence, and availability.

It is important to note that from a nucleus of a few growers who followed Meek & LeMaitre in successfully applying spring mechanization, there has grown an almost 100% acceptance in Western Yolo County. Now the only room for improvement is perfecting the chain of operations.

This story, squeezed into a nutshell, tells that:

1. A beet grower tried machine thinning without success.
2. He analyzed the reasons for poor results, laid out a program of coordinated spring mechanization, and succeeded.
3. His success was contagious; his neighbors adopted coordinated spring mechanization plans, and they too succeeded.

EDITOR'S NOTE

All of the material in this issue of SPRECKELS SUGAR BEET BULLETIN was written by the field staff of the Spreckels Sugar Company Agricultural Department.

The articles were developed from reports presented at the Agricultural Staff Meeting on February 1, 1961. Because all of these reports covered first-hand experiences under actual field conditions, it was believed that Spreckels growers in all beet growing areas would find the information of value.

PRE-EMERGENCE WEED CONTROL

By HAROLD VOTH

Field Superintendent, Spreckels Sugar Company

ENDOTHAL is a water-soluble sodium salt, Disodium 3, 6-Endoxo-Hexahydrophthalate. When used as a weed killer it is a liquid formulation containing two pounds of the chemical per gallon of water.

Endothal is most effective when applied during or just after planting. It is applied as a pre-emergence spray and can work effectively only when there is enough moisture to surround the weed seed with a solution of endothal as it is in the process of germination.

The common practice in the Salinas Valley is to spray the material over the seed bed soon after planting, or just before an impending rainfall—before the weed seeds have had an opportunity to germinate.

The common weeds most readily controlled by its use are malva, nettles, purslane, pig weed, burr clover, shepherd's purse and green foxtail. The weed showing the most resistance to its effect is chickweed, a weed of considerable economic importance to sugar beet growers in the Salinas Valley.

In reviewing the results obtained by the use of Endothal as a weed killer in sugar beet fields during the past two years (1959 and 1960), varied results were obtained. It is still too early to ascertain what the results will be this year because the rain that did fall came at such a late date. In fact, with the rains holding off so long, results could very well be so poor as to discourage the use of Endothal among the majority of growers using it at the present time.

In 1959, startling results were obtained, and this was evidenced by the sharp increase in the use of Endothal by growers in my area during 1960 with at least 80% of the growers employing its use as compared to the 20% who used it in 1959.

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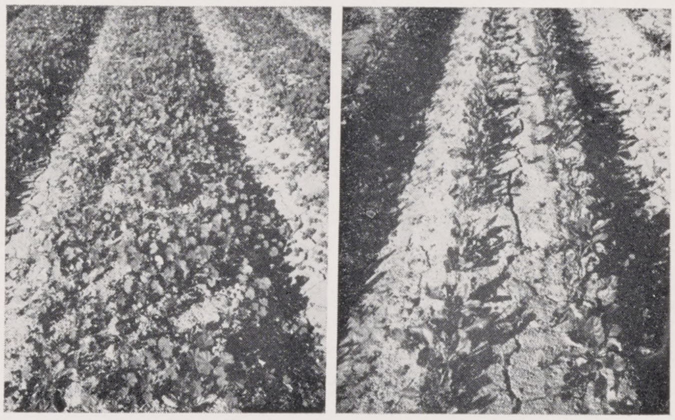

18

WEEDS (left) which emerge with beets in the Salinas Valley are malva, nettles, purslane, pig weed, burr clover, shepherd's purse or fox tail. **ENDOTHAL** treatment (right) can kill all of these weeds without affecting beets appreciably. But rainfall or controlled irrigation determine the effectiveness.

However, the results obtained during 1960 were not nearly as favorable as were obtained the previous years and local fungicide and herbicide agencies report that their Endothal sales have fallen off at least 30% from last year. Very few growers attained excellent control while the majority of Endothal users felt that only a fair amount of control was effected. A few growers experienced no control whatsoever.

In discussing with local soil treating technicians the reasons why Endothal produced such relatively poor results, the following facts were revealed:

1. There was a lack of adequate rainfall at the proper time. In many cases the time lapse between time of application of the material and sufficient rainfall was as great as eight weeks, giving the Endothal ample time to lose much of its effectiveness. (It is a proven fact that the shorter the time lapse between application of material and adequate rainfall, the more effective the control.)

2. The very small amount of early rain that did fall activated the microbial action of the soil on or near the surface causing the Endothal to break down and lose its effectiveness. However, the early rainfall was insufficient to carry the material into the zone occupied by the principal weed seeds.

3. Insufficient dosages of material in certain soils was a factor. Heavy clays and adobe soils respond much better than the lighter, sandy soils. Results on heavy adobe soils reveal that one gallon of material per acre, spread over the top of the bed and slightly down the shoulders, is adequate; while two gallons, spread similarly on lighter soil, are necessary because on this type of soil leaching becomes a problem.

4. Where the use of overhead sprinklers was employed, poor results were experienced, mainly because sprinkling was too severe. (Especially so in the lighter soils where Endothal was carried down too deeply into the soil and thus escaped the weed seed zone.)

5. Growth suppression of the young sugar beet plants where Endothal was applied was most apparent in the lighter soils, especially where severe crusting was a problem; while in the heavier adobe type of soil, little or no suppression was noted.

It is noteworthy that even though many of those who used Endothal in 1960 with poor results are again using it this year. When questioned as to why they would again employ its use, they answered by saying that they felt that the cost of the material and application was money well spent as an insurance against possible high thinning and weeding costs, and possibly to save a stand if prolonged rainfall became a reality.

They felt that some control was better than none, and thus the money spent was not wasted. It certainly does reveal that the farmer in the Salinas Valley is willing to pay for chemical weed control, even though it might not be complete at present.

It is encouraging that several new materials are

Continued on page 16

SOME INNOVATIONS IN CHEMICAL WEED CONTROL

By WILLIAM DUCKWORTH

Field Superintendent, Spreckels Sugar Company

THE USE OF HERBICIDES for the control of weeds in beet fields is an accepted and proven cultural practice in many areas of the state. However, as with any farming operation growers are not content to maintain the status quo; simplification or improvement of the operation is constantly sought. Not only is the possibility of improved use of existing materials always present, but new materials or newer methods of applying existing materials are being offered to the growers.

The recently expanded use of chemicals as an aid to weed control has brought about an increased effort by the various chemical companies to develop materials for use in the beet fields. In most cases, it is felt that the greatest success in the control of weeds can be obtained before they emerge. A great deal of field work is currently being done to test existing chemicals and to develop less toxic analogues of other herbicides.

The two materials that are presently used most extensively are TCA and Endothal. Tillam is now being produced in commercial amounts, and will be used this season on a field basis by selected growers. The two former chemicals have shown their worth again and again in commercial applications over large acreages. Recent developments in rates and methods of application are important enough to list.

SODIUM TCA

Sodium TCA has been a very successful herbicide for the control of watergrass. It is important to note, however, that the material is not effective against broadleaf weeds. TCA has an advantage of giving good control of grass throughout the growing season. An application of five pounds of the material per acre, sprayed in a 15" band, has been found to be most effective on 30" rows. Therefore, if the total area were covered, a rate of 10 pounds per acre would be required. If the material were applied to another row spacing, corresponding adjustments would have to be made in the rates.

Field applications of the material costs approximately $2.50 per acre at the rate of 5 lbs. per acre.

ENDOTHAL

This material is effective against a wide range of broadleaf weeds as well as against watergrass at normal application rates of one gallon per acre. In some cases, rates below one gallon per acre have given adequate control, thereby reducing the costs per acre for control. Cost per acre for this material will vary from $5.00 to $8.00 for normal conditions. (For more details on Endothal refer to page 11 of this issue.)

TILLAM*

This material can be used on a field basis this season. It is effective against watergrass and certain common broadleaf weeds. It is important that the material must be incorporated in the soil *immediately after application* by a rotary tiller. Fifty gallons of water is required for each acre of Tillam application. (TCA and Endothal can be applied with only 10 to 20 gallons of water.)

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*Stauffer Chemical Company trade name for propyl ethyl-n-butyl thiocarbamate.

METHODS OF APPLICATION

All of the above materials must be in the zone of weed seed germination to be effective. Therefore, it is essential that the materials be properly incorporated in the soil. This can be done in two ways: 1) by spray over the seed row followed by rainfall or overhead irrigation, and 2) by mechanical mixing. In some areas of the state, particularly the Coastal areas, early plantings allow the post-plant spray method to be used successfully. In other areas of the state later plantings necessitate irrigations for germination; therefore, the herbicide must be mixed into the soil prior to planting for adequate control of weeds.

Spray nozzles mounted between the listing shovels have proved to be an excellent method of incorporating the herbicide in the ridges. In some cases, the mounting of such spray equipment is difficult for the grower. If so, the broadcast method of spray application could be advantageous, since no specialized mounting of nozzles or tanks is needed.

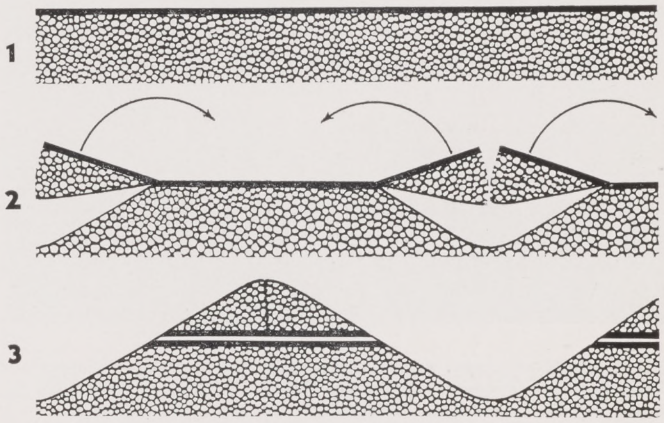
In the Tudor area of Sutter County this past year, Oji Bros. applied herbicides over the total surface area by fan nozzles mounted in front of the listing tractor. With this method the material, TCA for example, is applied at a rate of 5 lbs. per acre over the full surface area. The lister following the broadcast spray throws the treated soil into the ridge. The herbicide is thus concentrated in the ridge as is the case with tool bar mounted nozzles. This type of application has the distinct advantage of being available to any grower having a boom sprayer. A spray rig with a large capacity can precede the listing tractor without effecting normal operations. This broadcast type of application was used successfully with both TCA and Endothal.

19

MAS OJI, Art Oji and William Duckworth get ready to plant beet seed on a field which has been "weed-proofed" with Endothal and Sodium TCA.

20

SODIUM TCA, Endothal or both may be applied to the field before listing, either by airplane or ground rig.



21

CROSS SECTION of a field after applying weedicide.
1. The black line indicates ground surface impregnated with weedicide.
2. Lister shovels fold the soil over from the furrows to the bed-tops.
3. The finished beds have a double layer of weedicide at the seed-zone.

A variation of the broadcast type of application was also used successfully this past year in the Tudor area by the Oji Bros. In this case, the material, TCA, was applied preplant by airplane. The application was followed by a light disking, rolling and then flat planting to moisture. The rate of application of the herbicide was 10 lbs. per acre. Watergrass control in this case was equal to that obtained by ground application.

COMBINATIONS OF HERBICIDES

The application of a mixture of Endothal and TCA has shown definite advantages in the control of late growing watergrass in fields which also had

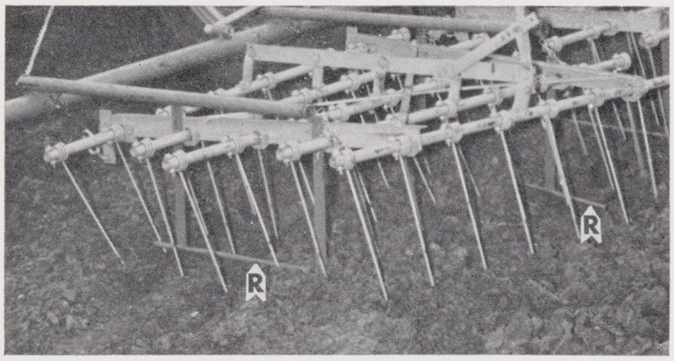
Continued on page 16

SPRING TINE HARROWS WIDELY ACCEPTED ON BED PLANTINGS

By J. W. HULL
Field Superintendent, Spreckels Sugar Company

ALTHOUGH THIS TOOL has been used in Idaho and the intermountain states for several years, so far as we know it was never used on beds before its acceptance in San Joaquin County.

Some of the early users of the harrow in the Stockton area were Joe Sanchez, Mario Podesta and Tanaka Brothers. These men, along with implement men and sugar company personnel, came up with the thought that sled runners were a necessary addition to the harrow if it were to be used on beds. These were made first of angle iron (unsuccessful), and later one inch (or larger) pipe. The pipe runners were extremely good in that they allowed the harrow to cross beds without any digging or jumping motion. These runners were placed on standards with slotted holes so that they could be adjusted for depth.

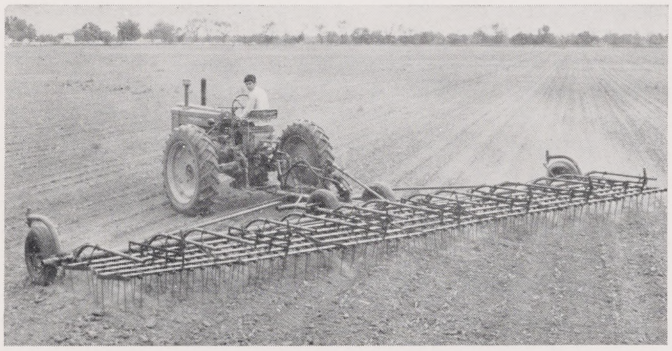


22

THE SECRET of success when using a spring tine harrow on bed-planted beets is the use of runners (R, R). These bridge the furrows and gage the depth of tine penetration. They should be made of larger pipe than shown here—1½" or 2".

We found that the harrows worked better before a cultivation than after, since a narrow cultivator core tends to break out.

We also discovered that any crawler type tractor that was not too heavy worked ideally in crossing beds. Any tractor the size of a Caterpillar D4, International TD9, and AC HD5, or lighter, will work ideally without causing exceptional mashing of beets or compaction of the beds.



23

THE GREAT width of a 7-section spring tine harrow permits one man to cover up to 10 acres per hour.

On the first pass we like to work directly across the beet rows, as this angle eliminates fewer beets than any other angle. Severity of action is gauged by forward speed of the tractor and depth of the tines. Usually not over one or two beet plants per five feet of row are eliminated in this first harrowing. The second pass usually is at a 45 degree angle to the row, performed as soon as possible after the first pass. This time there may be an attempt at stand reduction. The severity of reduction can be increased again by more speed, a deeper setting, or more acute angle with the row.

Beets may be harrowed from the cotyledon stage until almost harvest time. Any time the harrow isn't actually hurting the stand the operation is doing some good. This harrowing of tiny beets was tried and proved satisfactory by Floyd San Julian and Henry Pelucca of the Tracy area.

Later harrowing may cross the row until the beets become large enough so that the tractor is causing crown damage to the beets. All harrowing after the beet roots are over an inch in diameter is done up and down the row without any runners. This is very effective in elimination of late weeds.

WHY SO WELL ACCEPTED?

We have determined to our complete satisfaction that the continued and timely use of a spring tine weeder harrow in sugar beets has some real advantages over cultural methods used in the past. These advantages are here listed:

1. SPEED OF OPERATION.

The harrow has been used in varying widths from ten feet up to a maximum of thirty five feet. There seems to be no difference in the quality of work done, except that the wider widths leave fewer wheel or crawler tracks through the beets. Growers using the harrow have done excellent jobs of weeding, covering as much as ten acres per hour. No other equipment can give so much ground coverage during the same period of time.

2. GRASS AND WEED ELIMINATION.

By timely use of the harrow, all grasses and practically all weeds can be eliminated from beet fields. Growers in this area have produced up to thirty tons of beets per acre during a poor growing season with absolutely no hoeing. Also, the fields remain clean until harvest time.

No other tool has the positive action of the weeder tine in later plant cultivation. Any mechanical thinner now on the market leaving a beet uncut must necessarily leave any weed or grass that grows beside it. The harrow will eliminate that weed and leave the beet undamaged, provided that the teeth run deeper than the weed roots and not so deep as the end of the tap root of the beet.

3. PLANT STIMULATION.

The passing of the harrow leaves a fine mulch of the soil, very similar to that ideal tilth achieved by some gardeners in their home gardens. Never before in this area have we been able to obtain this degree of inter-plant cultivation. The sugar beets respond to this harrowing in an amazing fashion. Usually from two to three days after this tool has been passed through sugar beets, the greener color and increased growth can be seen easily with the naked eye. One Tracy grower made one pass across a field this last season and watched a greener, faster growth the full width of the harrow pass for a full three weeks afterward. The general appearance of the field suggested that a fertilizer strip had been run across the field.

Whereas no accurate records have been kept of the amount of plant stimulation, there is no doubt in my mind, or in the mind of anyone who has used the harrow, that this stimulation can be measured. I am also thoroughly convinced that it will prove to be a substantial amount.

My growers share my enthusiasm, and some are quite vocal. As said by Richard Tanaka, of Collegeville: "The harrow is one of very few pieces of equipment purchased by us in the past few years that has easily paid for itself in one season."

Joe Sanchez of Stockton reports: "The harrow is a MUST in my operation. Savings in hand labor was a tremendous item last year."

At least five manufacturers supply spring tine harrows. The choice of maker is one for the prospective purchaser. Five makes are here listed:

John Deere F930 carrier & 12A tine harrow section.
Farmhand-Melroe.
Kovar Cone coil spring harrow.
McCormick (IHC) No. 15 carrier & No. 8 coil spring harrow.
Noble Hydra-Cart & spring tine Harro-Hoes.

HOW MANY BEETS SHOULD THE THINNER LEAVE?

By LAUREN BURTCH
Agronomist, Spreckels Sugar Company

IN THIS ISSUE of the Sugar Beet Bulletin we have covered many of the latest techniques leading to complete spring mechanization. However, we have not made a recommendation for the final thinned stand of beets. Rather than give a specific plant population recommendation, because of the wide variations in California's growing conditions, we will merely relate some previous experiences with mechanical stand reduction.

Past experience leads to the conclusion that in well over 50 percent of the mechanically thinned fields the final stand count is too high. After the first pass down the field with a thinner, growers invariably believe the stand has been too severely reduced. As a result, the equipment is adjusted and too many beets are left on the balance of the field. Excessive stands reduce yield because the harvester fails to pick up many small beets and they never reach the factory. Consequently a good percentage of the field has no economic value.

Usually, beets under 1½ inches in diameter are apt to be left in the field. Clumps of beets and very high populations of beets contain large numbers which will not reach this size.

Compensating for spotty stands, where large skips are prevalent, cannot generally be accomplished by mechanical thinning methods. To expect heavy populations to make up to the differences can result in lower yields. Stands averaging less than four inches between plants will probably produce less tonnage than with plants more widely separated.

As row spacings increase in width, only partial compensation can be made with closer spacing down the row. Again, unmarketable sized beets will result. (Row spacings wider than 30" are not recommended.)

The following tabulation shows equivalent per-acre populations for various row spacings, and distances between plants. It would be very unusual to find a condition where it would be desirable to have stands less than 100 plants per 100 ft. of row or greater than 220 plants per 100 ft. of row.

EQUIVALENT PLANT POPULATIONS

Plants per 100 Feet of Row			Inches Between Plants (Average)
20" Rows	24" Rows	28" Rows	
100			12
110			11
120	120		10
130	130		9
140	140	140	8½
	150	150	8
	160	160	7½
		180	7
		200	6
		220	5½

SUGAR BEET NEMATODE CONTROL

By JOHN BRYAN
Field Superintendent, Sprecklеs Sugar Company

AFTER MANY years of producing premium crops of sugar beets, River Maid Farms, at Isleton, fell victim to an infestation of sugar beet Nematode. In cooperation with Jack Warren of the Dow Chemical Company it was decided to put on controlled trials, using Telone. Two methods of application were used, chisel application and water application at three rates for each method; 15, 20, and 25 gallons of Telone per acre. The increased response of the beets to the water application method was apparent soon after emergence. Chemicals were applied in December, 1959. Plot planted April 13, 1960, and harvested September 22, 1960.

Best results were obtained from 20 gallons of Telone per acre, applied by basin-flooding with 7 acre-inches of water. These results, compared to the untreated check, are given below.

	Tons Beets per Acre	% Clean Beets	% Sugar	lbs. Sugar per acre
Check	8.2	89.6	12.7	1864
Telone (20 Gals. per acre)	20.1	94.9	16.7	6392

PRE-EMERGENCE WEED CONTROL

Continued from page 12

being tested and soon will be available for commercial use. In fact, four new Endothal formulations are now being developed for which the following claims are being made:

1. Soluble in both water and oil.
2. Produce less injury to the young beet seedlings.
3. Are less affected by the microbial action of the soil.
4. Less subject to leaching, and thus will remain in the weed seed zone longer.

Another material called "Tillam," manufactured by the Stauffer Chemical Company, is being tested for weed control in sugar beets. This compound is quite similar to Eptam, but is said to have a much less injury potential to beets, a longer residual effect, and a broader spectrum of weed control.

In conclusion I would like to emphasize the extreme importance of proper chemical weed control as related to the profitable growing of sugar beets in the future. Everyone in our business is thinking seriously in terms of complete spring mechanization. We are all aware of critical shortages of the proper type of labor, which will continue to get worse rather than better as time passes.

Once the weed problem is solved, the goal of complete spring mechanization will soon be attained, and the growing of sugar beets will become more profitable, as well as less dependent on unpredictable labor supplies.

SOME INNOVATIONS

Continued from page 13

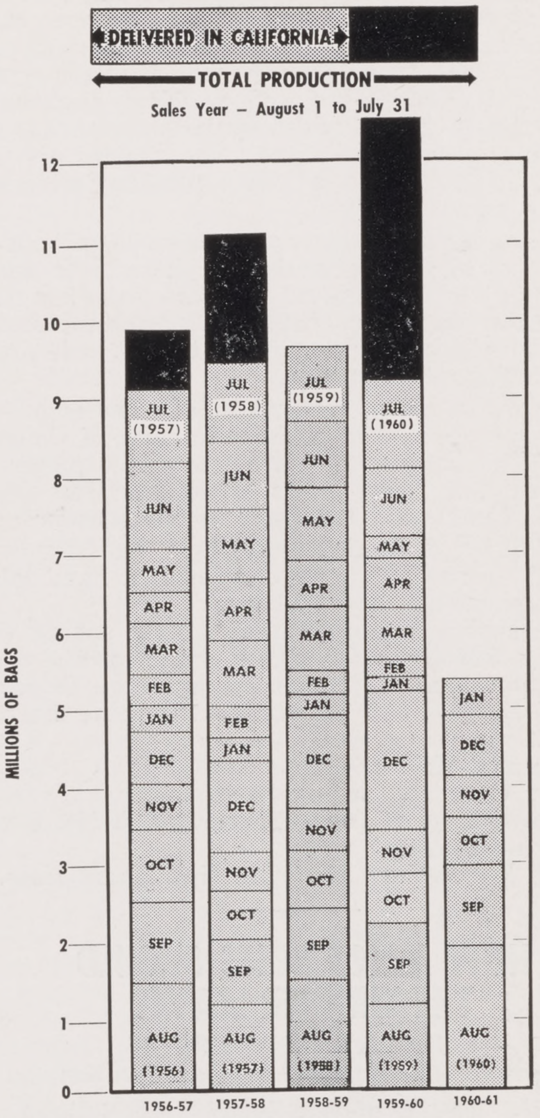
a broadleaf weed problem. Endothal at a normal rate and TCA at one-half normal rate were applied to one-half of a field. Endothal alone was applied to the remaining half of the field. In this case the combination treatment gave much better control of the late watergrass growth than did the Endothal alone. Early grass control was equal in both cases, as was also the broadleaf control.

POST-EMERGENCE APPLICATION

Post-emergence control of weeds is still a somewhat unpredictable procedure. Dalapon has given good results on barley when applied in proper amounts and under cool conditions. Barley kill was good and beet damage slight.

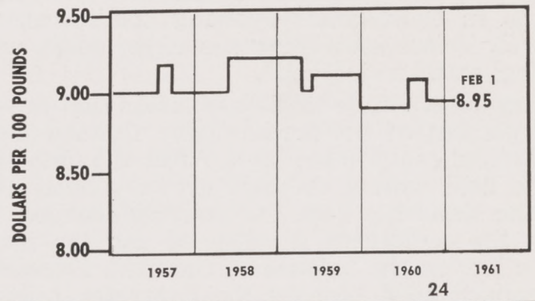
With the necessary increase in mechanical thinning, weed control is more important than ever for the best job to be done by the thinners. Therefore, these recent innovations in the use of herbicides should make it possible for more growers to take advantage of the money saving, labor reducing possibilities of destroying weeds before they become a problem.

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers. Mention of specific methods, devices and implements does not constitute an endorsement by the Company. All photographs by the editor unless otherwise indicated.

AUSTIN ARMER, EDITOR
SPRECKELS SUGAR COMPANY
WOODLAND, CALIFORNIA

JE 5 '61

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SPRECKELS SUGAR BEET BULLETIN

VOL. 25 MAY-JUNE, 1961 NO. 3

25

TIMELY AND FREQUENT

irrigation is the key to maximum beet yields with high sugar content.

GERMINATION
TOP GROWTH
ROOT GROWTH
SUGAR STORAGE

are the steps to a profitable crop. They all depend on adequate moisture.

TIMELY AND FREQUENT IRRIGATION

By J. NORMAN DAWE
Field Superintendent
Spreckels Sugar Company

THE THREE MOST outstanding factors of a plant's physiological environment are moisture, temperature and light . . . . the relative abundance of moisture available to plants has a more pronounced effect on the vegetation and on the adaptability of the area, or any portion of it, to crop production than does any other single factor of environment." This quotation is from *Ecological Crop Geography* by K. H. W. Klages.

Assuming the above quotation to be true, it follows that the best crops are going to be produced under optimum moisture conditions. That means that we need only furnish the beets with adequate, not excessive, water throughout the growing season on a TIMELY and FREQUENT schedule.

Sugar beets, because of their particular root system, are susceptible to growth stoppage from excessive drying of the top soil. Once this cessation of growth occurs, they resume growth only at a retarded rate when subsequent irrigation water is applied. This is why TIMELY and FREQUENT irrigations are essential to maximum production, and like lost sleep, a lost irrigation cannot be made up at a later date.

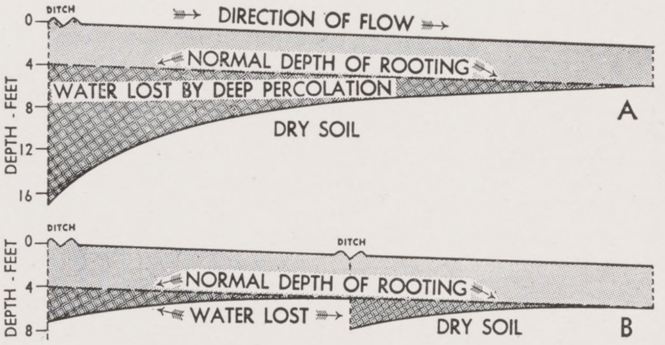
To inject some numerical values, beets should have about three to five acre feet of water through the growing season for normal production. (The lower limit in cool climates, the upper in hot climates.) Breaking this down further, assuming the ground was pre-irrigated and/or has substantially good sub-moisture, then a series of eight to twelve irrigations are in order at intervals of ten days to two weeks for a short growing season. By applying three to five acre inches of water at each irrigation, the approximate goal of three to four feet of applied water is achieved. Over a longer season, the total amount of water needed will perhaps increase, but the intervals should not vary far from the two week maximum. A reduction in the amount of water per irrigation would maintain adequate moisture over the longer period.

This type of irrigation would deviate from past practices for some growers, and can best be accomplished by shortening the length of the irrigation runs. On large acreages, it is sometimes difficult to think in terms of short runs and reduced sets in terms of hours. However, it is not impossible, because it is being done in certain instances. The need for this type of irrigation is further pointed out by Klages in a discussion of "Factors Interfering with the Absorption of Water by Plants."

Included in his list of factors is "the lack of oxygen in soils with excessive amounts of water." By infrequent, heavy, irrigations, of a duration longer than a few hours, this oxygen-starved condition is created, and the plants are not able to absorb the water moving past them. Absorption and growth is resumed only after the excess water is drained away from the root zone. With long runs it is practically impossible to keep the water level in the furrows below the crown of the beet in all areas of the field, and this condition lends itself disastrously to the introduction of rot and actual suffocation of the beet at the growing point. Add to this loss the cost of man-hours handling tail water together with longer-than-necessary pumping hours, and it does not sum up to a profit.

26

TIMELY AND FREQUENT irrigation maintains continued vigorous growth, and leads to maximum yields PLUS high sugar content.



27

A — LONG RUNS conserve a little labor and waste a lot of water.
B — SHORT RUNS conserve water; reduce losses by deep percolation and wasted tailwater.

TIMELY and FREQUENT irrigation maintains the continuous utilization of nutrients, and provides the beet ample time to utilize reasonable amounts of Nitrogenous fertilizers prior to harvest which of course is essential to maximum growth and sugar storage. The stop-and-start type of irrigation will not provide the fluid medium essential to movement of nutrients into the root system, and consequently, nitrogen is still present in excessive amounts at the time of the last irrigation preceding harvest. Net result—low sugar at digging time, and fewer dollars per ton of clean beets.

Perhaps one other rather intangible point should be mentioned. There is a real basis for the assumption that one of the best remedies for many disease

Continued on page 24

START THOSE PUMPS

By DAN L. DIETER

District Manager, Spreckels Sugar Company

IN DISTRICT 3, we have just completed spring harvest, during which many growers were plagued by low sucrose content. Fields which were low in sucrose last fall showed little improvement, although there was a slight upturn in late April. Various theories have been advanced by many people for these low sugars. Much of the blame has been laid to virus yellows, to the extremely hot temperatures which prevailed during the period from June 1 to September 15 of last year, and to red spider infestation. While it is true that these factors can cause a decline in sucrose content, the fact remains that while some growers have harvested 10 and 12% beets, other growers in the same area under the same climatic and disease conditions, harvested beets containing 14 to 16% sucrose. It is obvious that factors other than disease and weather were the cause of this decline.

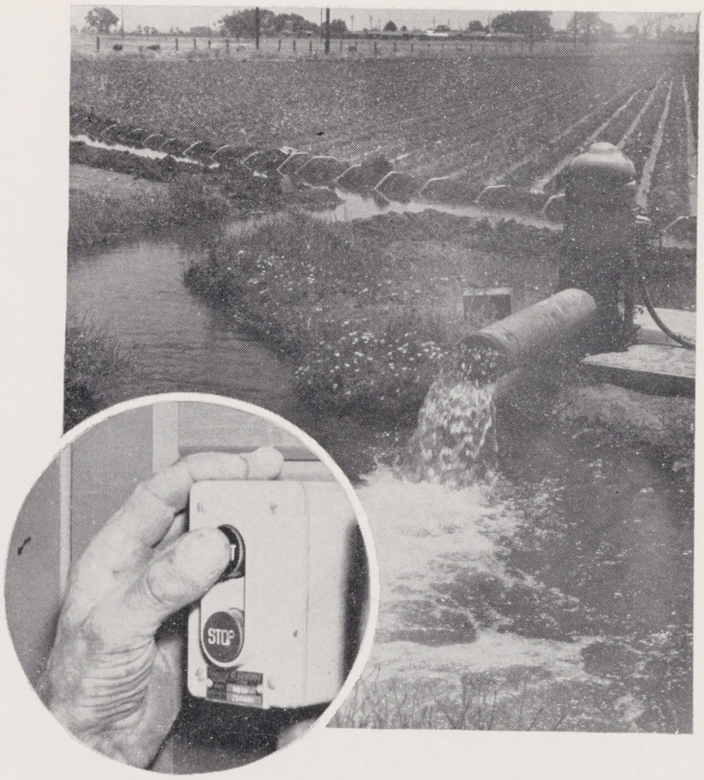
Two facts were apparent when the crop records were studied. First, the early planted beets showed heavier infection of virus yellows, while later plantings showed less infection. In most cases, the later plantings had higher sucrose content at harvest time.

The second fact was that during the periods of high temperatures last summer, many of the fields were under stress because of "too little, too late" irrigation practices. Last spring, up to around the middle of May, cooler temperatures along with occasional showers apparently lulled many growers into a feeling of false security regarding moisture needs. Fields were brought to a stand very slowly, by the rains, and these same fields were cultivated, thinned and fertilized before a drop of irrigation water was applied. When the temperatures suddenly soared to record highs in early June, these fields that had not been irrigated suffered serious setbacks. With continued record temperature peaks during the summer growing season, these beets never did recover from the combined shock of high temperatures and shortage of water.

It is universally known that any beet crop grown with inadequate moisture will not achieve maximum growth potential. Why, then, were so many fields allowed to suffer through the hot spells of last spring and summer?

A CASE IN POINT

An outstanding example of this neglect was observed this spring in the Dixon area. Approximately one half of the acreage in a field had been irrigated prior to the extreme temperatures. The balance of the field was irrigated after the hot spell and was under stress for water for a lengthy period during the summer. The earlier irrigated portion continued to grow vigorously during the summer. When harvest was halted by the rains in November, that portion was testing over 16% sucrose. Field samples taken from the later irrigated portion averaged just under 13% sucrose. All other conditions in the whole field such as virus yellows infection, fertility level and general care were identical. The only difference was irrigation procedure.



28

This spring, many fields have been brought to satisfactory stands by rainfall alone. These same beets are being cultivated, thinned and fertilized with no moisture in addition to this scattered rainfall. A rapid rise in daily temperatures, coupled with continued north winds, could raise havoc and place these beets under the same conditions of stress as occurred last year.

IRRIGATING FOR GERMINATION

In other Spreckels beet growing areas, particularly the San Joaquin Valley, it is common practice to start the irrigation water as soon as planting is completed, then to irrigate at least once (and sometimes twice) before thinning. By renewing the reserve moisture supply in the soil these plantings then go through the processes of cultivation, thinning and fertilization with little loss in growth. They are then in a much more vigorous condition to withstand the onslaught of hot weather or disease which may occur later.

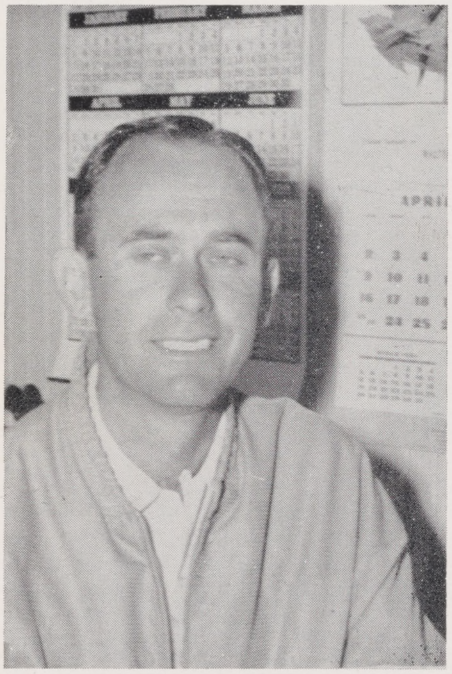
A large percentage of our growers in the Woodland district follow the procedure of irrigating to stands. Close observation reveals that they seldom have to do any replanting, and that their beets enjoy uninterrupted growth. It is not the purpose of this article to criticise the cultural practices of any grower or group of growers, but it is strongly felt that many growers should review their irrigation practices very critically and make the changes necessary to attain the following ends:

Continued on page 24

The 1960 Honor Roll

DISTRICT 1 — SPRECKELS

In accordance with the statement accompanying the 1959 Honor Roll, growers whose 1960 yields exceeded 30 tons per acre are here listed. Our congratulations to these growers—and to all growers in District 1, whose **average** yield in 1960 exceeded the previously coveted 25 ton figure.



T. B. Green Photo 29

WALTER BRYGGMAN
Farm Superintendent
K. R. Nutting Company, Salinas

He tops the 1960 Honor Roll with 44.97 tons per acre on 46 acres — and his beets tested 16.46% sugar.

Grower	Acres Harvested	Tons Per Acre	lbs. Sugar Per Acre
K. R. Nutting Co.	46	44.97	14,805
E. A. Ramirez	5	44.89	11,546
Schuman Farms	29	43.36	12,548
J. J. Crosetti	38	42.78	11,449
Waterman Farms	20	42.32	12,070
A. C. Hansen & Son	40	41.68	11,454
T. C. H. Co.	45	41.26	21,923
O. O. Eaton, Inc.	28	40.23	12,222
T. R. Nishimoto	18	39.92	13,653
Gerald Rianda	30	39.85	11,724
Richard Del Piero	8	39.76	11,968
Fujji Bros.	12	38.92	11,341
H. Y. Ikeda	15	38.91	10,817
Frank S. Corda	17	38.66	11,273
Alvin Noll	52	38.64	11,515
Peter Vucovich	13	38.63	11,913
Steve Pervetich	9	38.59	11,268
Alvin Noll	30	38.48	11,498
Peter A. Stolich Co.	19	38.07	10,340
Waterman Farms	29	37.95	10,596
Alvin Noll	12	37.74	10,575
Jim Fanoe	55	37.72	12,206
William Yamano	48	37.70	10,737
Sciaroni & Thorp	10	37.32	11,480
A. C. Hansen & Son	143	37.30	10,608
J. J. Crosetti	28	37.22	9,618
Gene Ferraro	15	37.16	11,408
Donald F. Davies	5	37.10	11,857
Jack A. Hayes	31	36.72	11,714
A. C. Hansen & Son	30	36.55	10,600
Clark & Togni	27	36.54	11,269
H. F. Trafton & Son	17	36.54	11,159
Nunes & Hooks	67	36.51	10,252
Gibson Bros.	21	36.49	11,334
Peter A. Stolich Co.	35	36.40	10,956
Joseph B. Silva	18	36.23	11,181
Louie Manzoni	10	36.22	10,576
Hugo Zamzow	12	36.96	10,349
John D. Domingos	27	35.91	10,658
C. T. & A. W. Johnson	63	35.60	11,385
Lindeleaf Bros	22	35.23	11,407
Jim Fanoe	107	35.00	11,228
Peter A. Stolich Co.	18	34.85	10,288
Peter A. Stolich Co.	44	34.67	11,143
Valdemar Schmidt	27	34.63	10,202
Jack A. Hayes	29	34.57	10,184
E. John Nielsen Co.	36	34.49	10,740
Merrill Packing Co.	27	34.47	10,955
Ferry Morse Seed Co.	35	34.30	10,173
Raymond Martin	137	34.29	11,850
Martella Bros.	30	34.25	10,638
R. G. Wood	21	34.11	11,277
T. Nunes & Son	25	34.10	9,848
Joe P. Gambetta	29	34.06	10,886
Herold Ranches	60	33.98	11,064
Harden Farms of Cal...	31	33.92	10,915
Frassetti Bros.	28	33.92	10,257
Tom DaRosa	101	33.91	10,865
William D. Crinklaw	99	33.89	10,899
Costa Bros. Dairy	32	33.87	10,588
E. H. Abeloe & Son	43	33.80	10,775
J. J. Crosetti	13	33.77	8,882
Art Manzoni	29	33.62	9,730
Leo & Robert Meyer	32	33.61	10,856
R. Buck Boone	64	33.58	10,161
James M. Johnsen	47	33.54	11,142
Franscioni-Griva Co.	38	33.47	10,456
Albert A. Rohde	59	33.45	10,898
M. De Francesco, Sr.	5	33.37	10,138
Ning Young & Sons	35	33.36	9,928
Manuel Cunha	70	33.25	10,613
Roy Fultz	65	33.24	10,663
Fransconi & Co.	28	33.24	10,344
William D. Crinklaw	127	33.23	10,886
V. Vanoli & Son	24	33.22	11,587
Manuel Dias	04	33.20	11,202
Tony Homen, Jr.	27	33.13	10,025
E. John Nielsen Co.	21	33.07	11,065
Joseph Gubser, Sr.	30	33.04	10,236
Walter Jefferson & Son	53	32.87	9,749
Salaberry & Guidici	50	32.74	10,595
Carl M. Mortensen	27	32.72	10,235
Harden Farms of Cal...	33	32.66	9,661
D. R. Lemos	41	32.62	9,395
Manuel Baliel	100	32.58	9,872
Franscioni-Griva Co.	26	32.56	10,172
A. Gill Ranch Co.	68	32.48	9,569
S. T. & A. W. Johnson	9	32.48	9,673
Ernest F. Bettencourt	14	32.48	10,588
Turri Bros.	33	32.47	10,585
Michael K. Reed	27	32.33	8,897
Schween Bros.	93	32.28	9,561
Sgheiza Bros.	41	32.18	10,278
Bob Corda, Sr.	18	32.13	9,832
Donald F. Davies	84	32.12	9,996
Michael K. Reed	54	32.10	9,495
Scaroni Bros.	20	32.07	10,564
Nunes Bros.	74	32.06	9,278
A. F. Silveira & Sons	28	31.98	10,259
C. Morgantini & Sons	28	31.90	10,368
Arnold Bassetti	17	31.89	10,269
Fenton O'Connell	24	31.83	8,849
W. & S. Packing Co.	16	31.81	8,067
Vanson Farms	19	31.65	10,350
Obata Bros.	81	31.63	9,464
William A. Hart	29	31.58	8,261
Joseph Gubser, Sr.	19	31.57	9,370
F. V. Birbeck Co.	24	31.56	10,162
W. B. Grainger Pckg...	35	31.55	9,415
Breschini Co.	16	31.49	10,184
Gerald Griffin	24	31.40	9,552
William J. Soares	34	31.38	10,098
Anselmo Pura & Son	24	31.33	9,324
Enos Vosti	8	31.16	9,871
T. C. H. Co.	14	31.01	7,188
Chester B. Imwalle	28	30.95	7,310
Phillips Wyman, Jr	29	30.92	9,727
Wilmer Pura	15	30.91	9,662
Arbrun & Scaroni	12	30.76	8,804
Art Weatherly	15	30.76	9,616
Dean Pryor	79	30.75	9,883
Salinas Val. Veg. Ex...	71	30.70	8,443
Jim G. Bardin	66	30.66	9,817
Waterman Farms	8	30.58	8,728
Schween Bros.	64	30.56	9,254
Obata Bros.	41	30.54	9,052
Tony Medini, Jr.	12	30.52	9,266
Robert Harban	16	30.51	9,818
Tom DaRosa	27	30.49	10,001
A. Radavero	13	30.49	9,360
Clark & Romans	72	30.48	9,406
T. O. Tomasello	28	30.47	8,458
Lee F. Smith	35	30.37	9,220
Schween Bros.	65	30.35	9,135
M. J. Kalich & Co.	24	30.33	9,463
Louie Ferrasci	59	30.31	10,033
M. G. DaRosa	30	30.27	9,287
James H. Watson	30	30.19	9,528
Bassi Bros.	44	30.19	9,443
Frank Wyrick	23	30.04	9,096
Foster Hutchings	27	30.03	8,943
P. W. Bertuccio	20	30.02	9,054
Tony F. Matulich	11	30.01	9,597
C. Morgantini & Sons	29	30.00	9,033

PRACTICAL IRRIGATION METHODS

By GEORGE W. WHEATLEY

Agronomist, Spreckels Sugar Company

ONE OF THE KEYS to success in irrigated farming is moisture control. Numerous experiments have shown that sugar beets respond to generous quantities of water only when it is applied properly.

After an irrigation or a heavy rain, soil pores are filled with water and roots can get all the water the plant needs. As each bit of water is removed, the next bit becomes more difficult to remove. Unless water is replenished, the plants cannot remove moisture fast enough to maintain their requirements, and they suffer from moisture stress.

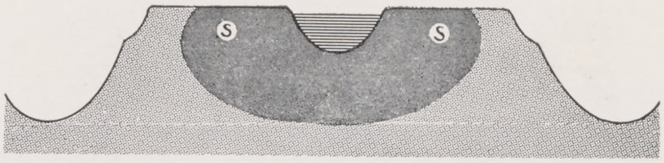
Roots are the food supply center for the plant. Roots absorb only dissolved mineral nutrients which are transported to the sugar manufacturing center —the leaves. Water and nutrients are absorbed readily only through new root tissues. Scientists agree that new roots—roots only a very few days old—are the main absorbing tissues of plants. After a very short time, the root covering becomes thick and tough and very little water can enter. In order, then, for a plant to remain healthy and develop vigorously, it must continue to produce new roots, and these are produced most rapidly when moisture conditions are favorable.

No practical method has been found to maintain soil moisture at a particular designated level. With irrigation or rainfall, the soil moisture reservoir is first filled; then drainage, evaporation and plant use deplete the moisture. The danger point of depletion under field conditions will vary with the depth and distribution of the plant roots and the sensitivity of the crop to moisture stress. To keep beet roots in the surface inch or two of soil free from moisture stress would usually require more irrigations than would be economical. However, when beets are small and the roots are close to the surface of the soil, a light application of water could be more important in contributing to high yields than a heavy irrigation applied after wilting of the young beets had occurred. The theory that "beet roots will go down for moisture if the irrigation is delayed" is a myth. Beet roots will not grow through dry soil; downward root development is actually reduced because of the inadequate moisture supply.

It should also be recognized that the dry surface soil areas are providing nothing toward the nutrient requirement of sugar beet plants. Under these conditions the plant's food supply is restricted by its limited feeding area, and new root development is reduced, resulting in a restricted rate of plant growth.

PRACTICAL IRRIGATION METHODS

Field irrigation practices are compromises between the cost of water and the optimum water for rapid growth. An ideal program for sugar beets should include at least one early irrigation of 2 to 3 acres inches of water. As the beets get larger and the roots penetrate deeper into the soil, irrigations can be spaced more widely and larger quantities of water can be applied. When rain supplies adequate moisture to germinate seed and support young beets, the first light irrigation may not be necessary. But be careful—when young beets wilt or suffer from lack of water yields are usually reduced, no matter how much water is supplied later.



30

EARLY IRRIGATION, as for germination, need not penetrate deeply. This cross section of a 2-row bed shows seeds (S, S) well surrounded by moisture soaking down from the small furrow rolled into the center of the bed.

After an evaluation of irrigation practices in the Salinas Valley by two beet growers—one a consistent 30-ton-per-acre grower, the other a 22 to 23 ton-per-acre grower— the frequency of irrigating their beets was increased. The 30-ton grower began irrigating his beets about every 7 to 8 days instead of every 8 or 9 days. The 22 to 23 ton grower doubled the number of his irrigations from two per crop to four. Both growers made the first irrigation relatively early, but light application. Their results have been quite comparable—each grower has increased his yield approximately five tons of beets per acre. The sugar percent of the beets has not been lowered by their different irrigation pratices. This is because nitrogen has been made available during the growing season, and was depleted before harvest time.

WHEN TO IRRIGATE

The timing of irrigation is as important as the amount applied in each irrigation. Excess moisture in the soil may be as damaging as insufficient moisture, because air is displaced from the soil so that roots cannot breathe. Factors which should be considered and evaluated very closely for determining when sugar beets should be irrigated are here outlined:

1. The soil texture and its drainage are determinants in scheduling irrigations. Heavy soils that have poor drainage require less frequent irrigating. Light, sandy, well-drained soils need to be irrigated more frequently with relatively light applications in each irrigation. gation.
2. Air temperatures and the movement of air influence the frequency of irrigating. Low temperatures without wind are conducive to low evaporation and transpiration, while high temperatures with wind increases the evaporation of water from the soil and transpiration of water from the plants.
3. The size of the beets influences the water requirements. Small beets require less moisture than large beets. However, the moisture they require *must be in their root zone.*

When irrigation practices are adjusted to maintain favorable soil moisture conditions, other good management procedures start to pay off. Yields usually increase, and there is no reduction in sugar content.

IRRIGATION REQUIREMENTS IN THE CENTRAL SAN JOAQUIN VALLEY

By STANLEY D. BAYER
Field Superintendent, Spreckels Sugar Company

WATER, PROPERLY APPLIED, is probably the greatest single factor in the production of sugar beets in the Central San Joaquin Valley. I have seen variety trials, fertilizer trials, and thinning trials rendered useless through improper irrigation methods or the absence of irrigation at a critical time.

The water requirement of sugar beets may vary from 3 to 6 acre feet, depending on soil type, climate, and rainfall. Consequently, with the high cost and scarcity of water in many area of the San Joaquin Valley, water management becomes extremely important, and growers should exercise every means at their disposal to insure proper irrigation.

WATER AND DISEASE

During the 1930's, sugar beet production in the San Joaquin Valley was nearly eliminated due to Curly Top, a virus disease transmitted by leaf hoppers. Plant breeders came to the rescue with resistant varieties which we now have. The California Department of Agriculture conducted a spray program during winter months to reduce leaf hopper population. These preventive measures restored beet growing in the San Joaquin Valley.

But it was found that young plants of resistant varieties continued to be severely damaged by curly top when allowed to suffer from lack of moisture.

31

TOO LITTLE, TOO LATE. Inadequate or delayed irrigation decreases resistance to disease. This beet suffers from BOTH drouth and curly top.

It has also been suggested that Virus Yellows, another virus disease transmitted by the Green Peach Aphid, will have far less effect on a field that has adequate moisture for the entire season.

WATER AND FERTILIZER

When a field is irrigated the water which moves up into the bed carries nutrients to the roots and eventually through the hair roots and into the leaves.

If a field is allowed to become dry, the growth of the plant will stop, as it is no longer fed. Since the supply of nitrates in the soil must be depleted prior to harvest for highest sugar content, it becomes increasingly necessary to adequately irrigate fields which appear to be high in nitrogen.

Generally speaking, two methods are used to apply water to sugar beets in the San Joaquin; furrow and sprinkler. Each has definite merit and every grower must decide which would be most beneficial for him. Furrow irrigation, the most widely used, is probably the most economical. Basically there are three requirements that must be met for furrow irrigation. These are: Level ground (.1' to .2' fall per 100'), good penetration, and good drainage. Of the three, only penetration may be improved after the crop is planted. This may be accomplished by chiselling furrows 6" to 8" deep, two or three times during the growing season. Care should be taken that chisels are not deep enough to lift the plants as they pass. Drainage should be anticipated before irrigation is begun, since standing water produces a heavy crust. encourages water grass, and causes severe rot losses.

THE CASE FOR SPRINKLING

Sprinkler irrigation is gaining wide acceptance in areas where water is scarce, or on alkaline soils where penetration is a problem. I have seen this dramatically demonstrated near Mendota. Here beets were planted on January 20th of this year. We received 1.49" of rain the 25th through the 29th. This produced run-off, while wetting the soil to a depth of only 5". Low volume sprinklers were installed in the field. In twenty-four hours, with 9/64" nozzles they had wet the soil to a depth of 3 feet with very little run-off.

Timing is probably the most important phase of irrigation, and must be anticipated the previous year, when a producer determines his crop program. Such items as quantity of water available at different periods, peak summer demands of beets and other crops; and provisions for tail water are all factors to consider in determining when to plant beets and how to schedule their irrigation.

It would be very difficult to say just how many times a grower should irrigate or at what intervals, since this would depend largely on weather, soil type, and harvest date. The irrigations practices of three very successful growers will illustrate the wide variations..

Location	Type of Irrigation	No. of Irrigations	Water Used, Inches	Tons Beets per Acre	Pounds Sugar per Acre
Firebaugh	Sprinkler	9	40	23.3	6,870
Firebaugh	Furrow	12	54	29.3	9,500
Fresno	Furrow	16	90	34.5	10,075

I should like to point out that the last grower listed has a greater amount of water applied for two reasons; his soil is much lighter than the other two fields, and his beets were large through the summer months, and therefor required more water.

WATER CONSERVATION

During dry years (and occasionally in wet years), unforeseen water shortages develop. When this hap-

Continued on page 24

RAINFALL OR IRRIGATION?

By JOHN McDOUGALL

Field Superintendent, Spreckels Sugar Company

APRIL SHOWERS BRING MAY FLOWERS. The sloganeer responsible for this trite observation was not a successful beet grower in the Sacramento Valley. The beet grower who depends on rainfall to germinate the beet seed he plants in March or April may indeed have May flowers—mustard and morning glory—and precious few sugar beet seedlings.

But the grower who irrigates for germination can be sure of a plentiful, uniform stand of sturdy beet seedlings. They may emerge before a north wind seals them into a crusty grave (north winds so often follow spring showers). They will continue to grow vigorously, because their roots will bore into well-moistened soil—and not into the dry clods and dust underlying a rain-sprinkled surface, moistened just deep enough to sprout the seeds.

Mechanical thinning demands *uniform* stands, not heavy stands. The old philosophy of planting 7 or 8 pounds of seed per acre as insurance against poor emergence is outdated. The grower who anticipates mechanical thinning will plant from 4 to 10 seeds per foot (2 to 5 pounds per acre on 30" rows). Then he will irrigate, making sure that the greatest possible number of these seeds will emerge.

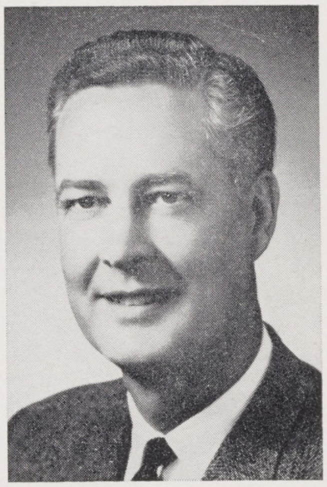
32

RAIN CLOUDS may be gathering, but the prudent grower will irrigate his newly planted field to insure not only germination, but continued vigorous seedling growth.

During this same spring season, damping-off is also a problem. Shallow planting is a prerequisite for getting stands in a disease ridden environment. Under such conditions a shower might be enough to germinate a stand, but it is not enough to hold a stand—some seedlings live, some die, some are stunted. Beet seeds need enough moisture to germinate them, and, most important, to carry the crop through thinning time. Mother Nature's spring-time irrigation system cannot be depended upon to do this. Hence, we *must* irrigate to insure this hard-to-get, uniform stand of seedlings.

So if a beet grower is to govern his planting and irrigating practices by a slogan, I suggest: *"It Ain't Gonna Rain No More, No More . . . . . "*

DIRECTOR OF RESEARCH POSITION FILLED BY DR. R. T. JOHNSON



Hurl Swartz Photo 33

ON MARCH 23, the Directors of the Spreckels Sugar Company created the position of Director of Research, and at the same time announced the appointment of Dr. R. T. Johnson to fill this position.

Dr. Johnson has been in charge of Spreckels agricultural research since 1950, and his intensive program of variety improvement is well known to Spreckels growers. He will assume his new responsibilities for both chemical and agricultural research immediately.

Dr. Johnson is a native of Utah. He received his bachelor of science degree from Utah State University. After serving as a captain in the Marine Corps during World War II, he completed his graduate work for a Doctor's degree at the University of Minnesota, in the field of Plant Genetics.

Dr. Johnson will continue to maintain his office at the company's plant at Spreckels, where headquarters for agricultural research are maintained.

CONGRATULATIONS!

SPRECKELS IS PROUD to be associated with the fine, young people shown in the photograph. They are Miss Diana Day of the Anderson 4-H Club in Anderson, California, and Mr. Cavitt Moon, San Benito County Future Farmers of Hollister, California. The third party in the photograph is Miss Day's steer "Sugar Foot." The occasion of this photograph was the recent Junior Grand National Livestock Exposition in San Francisco. Each of these young people is a recipient of a San Francisco Junior Chamber of Commerce Merit Award. A number of

Bill Serpa Photo 34

these awards are granted each year at the "Cow Palace" to outstanding farm youth. The sponsoring companies contribute toward the purchase of a steer by the award winner. This steer is brought back to the "Cow Palace" one year later and is judged in a special class. In 1960, Miss Day was sponsored by the Spreckels Sugar Company. Mr. Moon is the 1961 recipient of Spreckel's award.

TIMELY AND FREQUENT

Continued from page 18

problems is to maintain a healthy, strong, rapidly growing plant from seedling stage until harvest. Under most adverse environmental conditions, including disease, the effect of a water stress on the plant will magnify many fold the adversity, whereas adequate moisture will rectify many minor ailments. Many of the disease problems of the San Joaquin Valley have unquestionably been aggravated by irregular or infrequent irrigation.

The current growing season to date has been fairly good, and I feel that yields in 1961 here will be directly related to the irrigation practices which are under way right now.

START THOSE PUMPS

Continued from page 19

1. Bring the beets to a stand earlier. This will gain valuable growing time with corresponding increases in tonnage and sucrose.
2. Schedule the subsequent irrigations to minimize the effect of adverse weather conditions which might lead to continued moisture stress.
3. Follow an irrigation schedule that will keep the beets in an uninterrupted healthy and thrifty condition. A healthy beet is a lot more disease resistant than one growing under an inadequate or badly timed irrigation schedule.

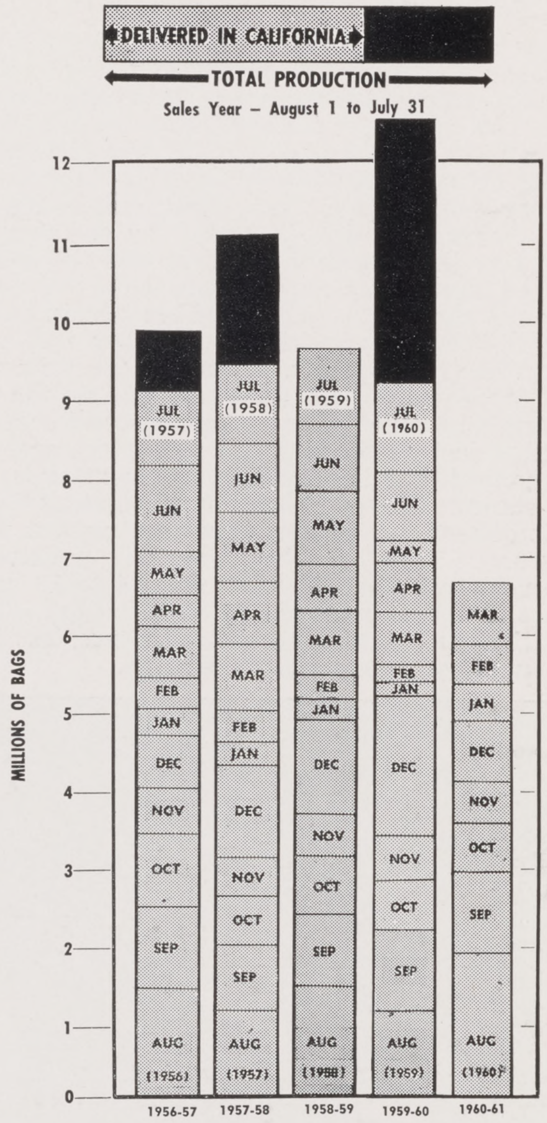
CENTRAL SAN JOAQUIN

Continued from page 22

pens there are a few things a grower may do to conserve water. Irrigation of every other row is the simplest. This will take about one-third less water on most soils. If his beets are nearing maturity he may elect to harvest a portion of the field and irrigate as much more for which he has water. Partial harvest should be accomplished while the soil is still somewhat moist, as beets have been known to decrease as much as 8 tons per acre from excessive drying. Irrigation runs not to exceed one-fourth mile in length will also help to conserve water.

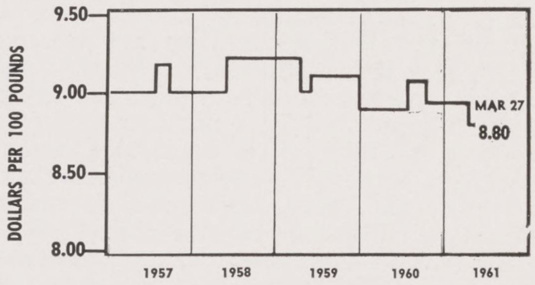
In conclusion I should like to say that water represents only about 15% of the total cost of sugar beet production. Properly used, this water can contribute to the maximum potential yield of the land. Improperly used, the same water investment may return only half the same yield. Consequently, the investment in water can yield a handsome return when the water is properly used.

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers. Mention of specific methods, devices and implements does not constitute an endorsement by the Company. All photographs by the editor unless otherwise indicated.

AUSTIN ARMER, EDITOR
SPRECKELS SUGAR COMPANY
WOODLAND, CALIFORNIA

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

SPRECKELS SUGAR BEET BULLETIN

VOL. 25 JULY-AUGUST, 1961 NO. 4

JY 27 '61

36

A WELL MANAGED HARVEST

will deliver clean beets, free of tops, weeds or clods.

DEFOLIATION

TOPPING

DIGGING

DIRT REMOVAL

are the four steps in good mechanical harvest. Machinery makers offer important improvements in each step. The rest is the responsibility of harvest management.

HARVESTER MANUFACTURERS ARE TACKLING DIRT AND TRASH PROBLEM

By AUSTIN ARMER
Agricultural Engineer
Spreckels Sugar Company

ON MAY 11 I wrote or telephoned the principal sugar beet harvester manufacturers throughout the United States. I said:

"I am gathering the material for the July-August issue of the SPRECKELS SUGAR BEET BULLETIN and in this issue I want to have articles from each of the leading sugar beet harvester manufacturers stressing the work they are doing in the direction of eliminating trash and dirt from the beets as delivered by their machines - - - "

The response was more than gratifying. And best of all, every one of the manufacturers showed solid achievements in the direction of delivering cleaner beets.

Some harvester builders are offering completely new machines; others have made major improvements in dirt removal. Space limitations in this issue have demanded severe shortening of some of the contributions. So in order to present the whole story, we have, in some cases, used only captioned photographs. These, in turn, have been classified in accordance with the operational sequence indicated on the cover, arranged in three groups. These are:

DEFOLIATION AND TOPPING
DIGGING AND DIRT REMOVAL
NEW COMPLETE HARVESTERS

COMPLETE HARVESTERS

BLACKWELDER MANUFACTURING COMPANY is finalizing field tests of a prototype harvester—the Marbeet "Twin." This is a two-row pull-type machine with which one tractor driver completes the harvest in one pass, putting 2½ tons of clean beets into its self-unloading hopper, while a foliage belt windrows the tops.

The Marbeet "Twin" has harvested up to 400 tons of beets per day. Working in a field yielding 28 tons per acre planted on 34" row spacing and powered by a Model 560 Farmall operating in third gear, the Marbeet "Twin" loaded one ton per minute continuously, hour after hour.

Even at this high speed loading rate, factory tare was held to 3%, and dirt tare was ticketed at 530 pounds in 8 tons delivered . . . again a 3% average. Two prototype machines operating in the spring harvest in the Imperial Valley have each loaded an average of 450 acres of sugar beets since put into operation.

Greater cleaning action is provided by longer conveyor flights, while over-running chains in the elevators scrub excess dirt off the beets before they are loaded into the collecting cart.

The Marbeet "Twin" can be adjusted to work on row spacing variable from 20" to 44".

Retention of the original Marbeet spiked wheel principle and "out of the ground" topping result in beets with a minimum of tare and topping loss.

The new Blackwelder "Twin" may soon be seen in action in the San Joaquin Valley harvest. Ernie Blackwelder, President of Blackwelder Manufacturing Co., has stated that further demonstration and development in other growing areas will follow.

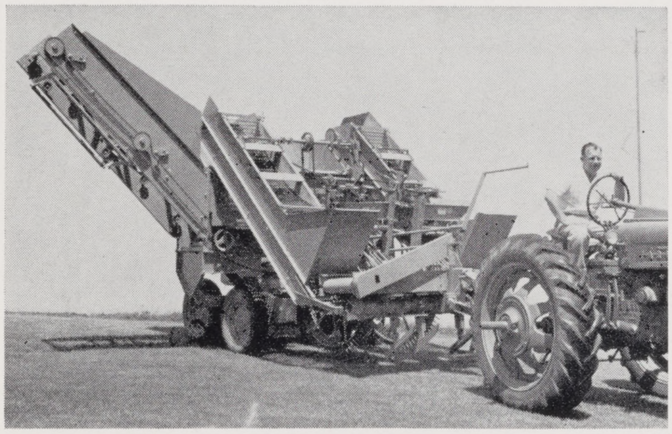
FARMHAND, of Hopkins, Minn. is introducing the 1961 Farmhand-Oppel beet harvester.

The newest unit of the tank-type machine is the integral disk topper and rubber flail beater.

This unit was used extensively in the Imperial Valley and has proved itself very effective in holding the top tare below the 2.5% figure. There will be at least 10,000 acres of experience and testing behind this machine before the 1961 fall harvest starts in Northern California.

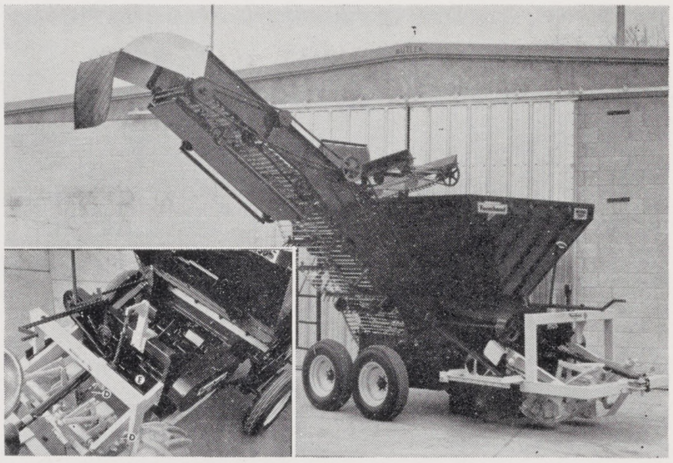
The topping unit was largely developed in Southern California in an effort to effectively top and scalp beets which protrude above the surface of the ground without sacrificing a good topping job on neighboring plants which grow even with the ground level.

The rubber flails serve to increase cleaning of the beet as well as divert it to the cleaning bed. There



37

THE MARBEET "TWIN"—2-row harvester.



Farmhand Photo

38

THE 1961 FARMHAND 2-row harvester. Inset shows the topping unit, with toothed disks (D, D) and rubber flail beater (F).

has also been much thought put into multi-roll screen, such as Spreckels Sugar Company uses at its receiving stations, being incorporated in the cleaning bed. This should be completed and at least partially tested in time for fall harvest in California.

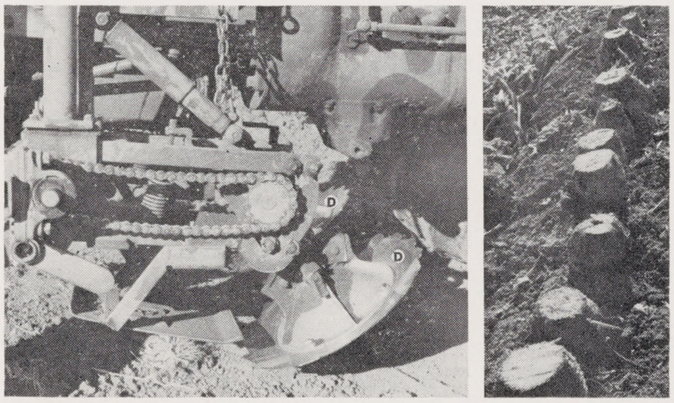
INTERNATIONAL HARVESTER COMPANY has been doing some intensive beet harvester development work in the Stockton area. Detailed information on the prototype is not yet available for publication, but suffice to say that the experimental machine employs old and well-tried principles, and interprets them with modern sophisticated techniques.

DEFOLIATION AND TOPPING

39

THE BRADY CHOPPER is a heavy duty forage chopper. This machine was photographed in Leroy Leonard's field near Woodland on the last day of the 1961 spring harvest.

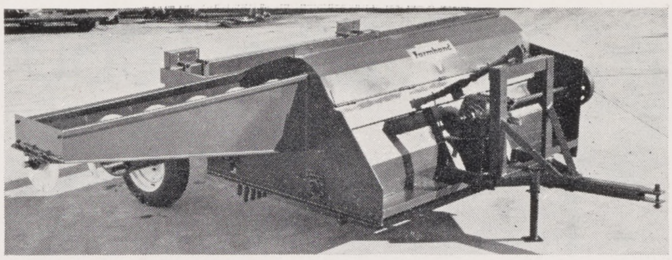
This is a defoliator only. It disintigrates all tops, weeds or seed stalks, including excessively high beet crowns. It is followed by a rubber flail beater; then the beets are dug, cleaned and loaded.



40

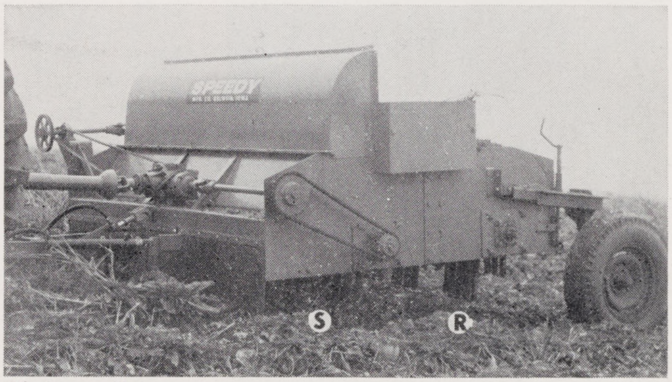
THE GEMCO TOPPER employs two fast-spinning notched disks (D, D). These disks accurately crown the beets. A rubber flail beater (not shown) on the same tractor scrubs off side-growing petioles or leaves.

The result is shown on the right. It is possible to mount this topper on the same tractor which pulls the digger loader, but it is preferable to use a separate tractor, and to let a few hours elapse between topping and digging, to allow the chopped tops to dry up.



Farmhand Photo 41

THE FARMHAND MODEL 88 DEFOLIATOR. This unit incorporates the rotoshedding ability of steel flails followed by rubber flails which sweep the row. The steel flails defoliate all the tops, weeds and grass above the beet crown, placing them into an auger which delivers into a windrow. The material at ground level and anything not eliminated by the steel flails is then swept clean by the rubber flails. The defoliator is not designed to be a top saver, but has been used as such in some areas. It is manufactured in a 66-inch and 88-inch size.



Gib Maurer Photo 42

THE SPEEDY TOPPER combines defoliation and topping; under favorable conditions one pass will leave perfectly topped beets ready for digging.

Steel flails (S) defoliate and crown the high beets. Rubber flails (R) scrub off remaining leaves or petioles.

DIGGING AND DIRT REMOVAL

ONE OF THE outstanding accomplishments of 1961 in reducing dirt deliveries was made in the Gemco cart harvester. Mr. E. C. Rollins of General Machine Company tells of this work: "Keeping the amount of clods delivered by beet harvesters in the heavy soils of California to a reasonable percentage of the total beet load has always presented a problem to harvester manufacturers."

"In exploring avenues wherein additional cleaning capacity could be incorporated into the cart type harvester, it was decided that installing a cleaning screen in place of the potato chain on the upper cross conveyor presented the most likely way to accomplish additional cleaning. It was further decided to try using the square cleaning rolls developed by Austin Armer of Spreckels Sugar Company in this experimental screen. Since practically all the loose soil has been eliminated from the beets by the time they are delivered to the upper cross conveyor, we felt that the latter would be a good place for us to observe and test the clod elimination ability of the Spreckels rolls."

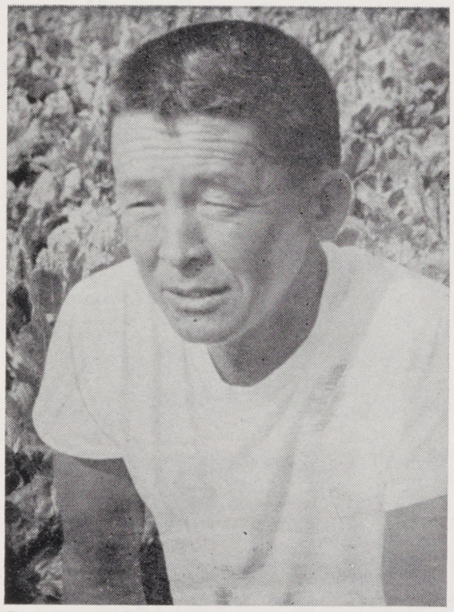
"Incidental to the installation of this cleaning screen was the job of providing suitable dirt chutes

Continued on Page 30

The 1960 Honor Roll

DISTRICT 2—MANTECA DISTRICT 3—WOODLAND

It is our privilege to present this long list of Manteca and Woodland growers whose yields exceeded 25 tons per acre.



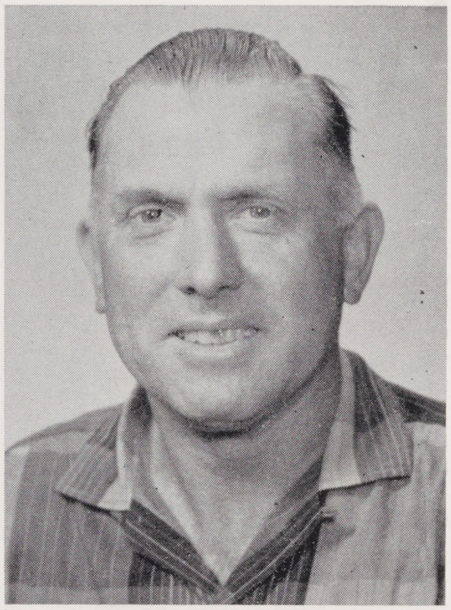
Dan Banta Photo 43

GEORGE TOMURA

Top grower in District 2

DISTRICT 2 — MANTECA

Grower	Acres Harvested	Tons Per Acre	Lbs. Sugar Per Acre
Geo. Tomura	25	39.02	11,917
A. & R. Lagorio	25	38.45	10,951
Kiyoi Bros.	50	38.23	11,423
Joe Sabbatini	40	37.33	10,437
C. Van Elderen	13	36.22	10,424
Tom Sanchez	76	35.38	11,024
F. L. Williams	27	35.09	9,025
Donald Fink	45	34.66	8,887
John Celle	25	34.31	9,236
West Coast Grape Farms	45	34.21	9,510
Gerritt Velthoen	21	34.21	9,285
John O. Paulson	38	34.20	10,452
Frank Giannecchini	25	34.17	9,697
Sousa Bros.	91	34.05	9,561
A. Pellegri & Son	33	34.02	10,179
Edward Lagorio	83	33.98	10,377
Johnny Dasso	21	33.94	9,435
Lovegreen & Wilson	21	33.76	9,054
Albert Fonseca	32	33.02	9,662
Hengst Farms, Inc.	30	32.92	8,903
Norman & Westling	69	32.76	10,477
Henry Baumgartner	8	32.48	8,211
Anna Garsino	5	32.46	8,965
John L. Miller	40	32.42	9,356
Louis W. Pelucca	30	32.37	9,925
Norman Thorkelson	23	32.37	7,949
Vincent Kovacevich	28	32.33	7,889
Warren W. Royce	73	32.20	10,652
Hanson & Barkley	46	32.14	9,237
Manuel J. Gonsalves	62	32.13	8,932
C. T. & T.	34	31.96	7,837
Roland F. Oliveira	28	31.94	9,505
Charles Utterback	14	31.72	8,438
S. Nogare	68	31.64	8,853
Hanson & Barkley	98	31.58	7,503
H. N. Crecelius	95	31.44	9.017
Norman & Westling	32	31.18	7,296
Q. L. & Larry Gerhart	38	31.05	8,344
Dwayne Petz	77	30.93	8,772
Tom Sanchez	50	30.89	9,594
Nobuo Sakamoto	101	30.87	9,063
David Vana	27	30.86	8,721
Vito & Margaret Lileo	28	30.59	8,125
Alberg & Son	48	30.44	9,217
Gogetti Bros.	100	30.44	7,647
Frick Bros.	121	30.39	8,278
Giannecchini Bros.	61	30.37	8,170
Sakakura Farms	62	30.22	9,574
Johnson & Moore	79	30.11	9,057
Geo. H. Clever	31	30.11	9,671
Enos & Woodward	36	30.06	9,415
Kaiser & Lindeman	146	29.91	8,847
Grant & Wilson	94	29.50	8,242
E. Dondero	25	29.43	7,875
John Narducci	28	29.33	8,330
Manuel Fialho	48	29.22	8,164
Guido Biagi	25	29.20	8,293
Joseph D. Valenti	30	29.09	8,523
Palm Farms Inc.	29	29.01	8,494
Pastorino Bros.	33	28.96	9,545



Hector Martin Photo 44

RALPH W. POLLOCK

Top grower in District 3

Grower	Acres Harvested	Tons Per Acre	Lbs. Sugar Per Acre
H. E. Nagata	41	28.95	8,135
George Maria & Samuel De Leon	18	28.73	8,941
Uyeda Bros.	49	28.63	8,211
P. Freggiaro	14	28.47	8,234
Tanaka Farms	185	28.41	8,176
Locke Ranch	32	28.37	8,642
Jack D. Jones	12	28.37	7,904
Dasso Bros.	51	28.34	7,686
Leonard Vieira	29	28.33	9,377
Norman & Westling	67	28.27	8,543
Joe E. Maciel & Sons	88	28.23	7,972
Amerigo S. Sandrini	15	28.20	6,542
George & C. O. Hansen	5	28.17	6,581
Nobuo Sakamoto	18	28.05	8,353
Merlin Miller	37	28.03	8,336
John & Robert Bogetti	110	28.01	8,033
Floyd Hudiburg	30	27.88	7,338

Grower	Acres Harvested	Tons Per Acre	Lbs. Sugar Per Acre
J. Howard Porter	55	27.65	7,902
Stuart A. Lewis	36	27.59	7,979
Perez & Llano	62	27.56	7,507
Tony A. Sanchez	125	27.55	8,061
Kenneth Thoming	5	27.51	8,022
George Hansen & Co.	22	27.51	7,923
Mario Podesta	72	27.48	7,826
H. N. Crecelius	72	27.45	7,499
Joe Sanchez	70	27.41	8,190
Melvin A. Baumbach	76	27.17	8,319
Coberly West Co.	51	27.08	6,824
R. E. Thorsen	78	27.06	7,398
Takemori Bros.	90	27.05	8,202
Edward F. Longeval	53	26.94	6,940
Brannan Farms	20	26.80	8,120
Charles Utterback	16	26.73	7,468
Francis Gnesa	25	26.47	7,925
Bogetti Bros.	150	26.40	8,279
Garry Fisk	1	26.35	8,580
Terry & Bettencourt	32	26.34	7,644
Howard E. More	30	26.32	7,564
Takemori Bros.	13	26.29	8,055
Walter C. Williamson	30	26.13	7,912
Nick Spanu	34	26.13	7,316
Coberly West Co.	71	26.06	6,124
Kenmar Farm	90	26.05	7,096
David F. Barker	25	25.97	7,209
Molatore Bros.	25	25.97	6,051
Seven Standard Rch.	140	25.89	6,131
Arthur A. Sakamoto	28	25.84	7,039
Ed Thoming	63	25.81	7,903
Paul Bettencourt	34	25.81	7,366
Dompe Bros. Inc.	35	25.79	6,907
George Matsuoka	23	25.77	7,350
John J. Armanino	77	25.71	6,042
A. L. Lagorio	25	25.63	7,581
A. La Bue Farms	47	25.62	6,133
Joe Sanchez	152	25.61	7,908
John Baragno	34	25.60	6,948
Norman & Westling	19	25.55	6,812
Joe Lopes, Jr.	43	25.55	6,740
Jack Kimoto	22	25.46	6,920
Frick Bros.	118	25.43	7,161
Robert Cardwell	28	25.31	6,565
John Kautz	25	25.31	5,912
San Julian Bros. & Zabalza	66	25.23	6,913
Martinelli Bros.	41	25.22	7,082
Gerald A. Prater	25	25.18	7,463
Albert Lerno	26	25.18	6,975
Caminata & Podesta	31	25.06	7,432
J. G. Fanucchi & Son	34	25.00	7,675

DISTRICT 3 — WOODLAND

Grower	Acres Harvested	Tons Per Acre	Lbs. Sugar Per Acre
Ralph W. Pollock	52	37.41	8,069
Mas Oji	137	36.47	9,818
Oji Bros., Uno & Terao	77	36.29	9,334
Grimmer & Arcand	44	35.99	10,833
Martin Bros.	14	34.62	7,928
M. Martinez	34	33.27	7,832
Tsuji & Inouye	9	33.03	8,495
G. M. Struve & Son	96	33.03	8,482
Ted Mata, Jr.	27	32.93	9,602
Meek and LeMaitre	21	32.79	8,237
J. R. Morris	24	32.42	9,071
Nishikawa Bros.	82	30.88	7,806
N. F. Lammers	7	30.85	8,089
Dixon Dryer Co.	35	30.79	8,024
Meek & LeMaitre	70	30.77	7,969
Dixon Dryer Co.	72	30.75	9,157
C. M. Ordonez	67	30.65	8,974
Catherine Strehle & Sons	85	30.56	7,652
California Packing Corporation	147	30.53	7,956
Max Toledo & Son	178	30.57	8,759
Hamatani Bros. Farms	59	30.29	7,118
Dela Torres Bros.	36	30.21	8,513
Mervyn Awyang	88	30.13	9,141
Dela Torres Bros.	29	30.10	7,272
K. L. Morris	118	29.91	7,699
Katoaka Bros.	29	29.88	7,500
Wilson M. Lovvorn	56	29.81	8,394
Plank and Maupin	20	29.57	7,753
Joseph A. Kergel	25	29.47	7,733
Elwood M. Olson	102	29.41	7,317
Frank E. King	56	29.20	6,839
Rudy Howald	202	29.03	7,977
Leroy L. Leonard	79	28.74	5,995
Fred H. Rehrman	116	28.73	8,303
Meek & LeMaitre	94	28.71	6,913
R. J. Weyand	32	28.64	8,019
Tokuji Morita	20	28.64	7,916
Joe Yeung	50	28.54	7,569
Walter M. Rigney	102	28.42	8,327
Ralph O. Blann	6	28.30	7,777
Roy Hatanaka	30	28.20	7,676
D. M. Sparks	25	28.09	7,096
E. L. Wallace	28	27.94	6,449
G. M. Struve & Son	341	27.88	6,719
John J. Vanetti	37	27.79	6,608
Mary & Manuel Bastiao	37	27.68	8,525
Schneider Fricke & Schneider	70	27.65	5,314
Erle C. Warnken	70	27.60	8,655
C. E. Frazier	26	27.54	7,618
James I. Tadlock	15	27.52	7,854
Wallace Bros.	46	27.49	7,037
E. L. Wallace & Sons	36	27.45	7,269
Scott S. Yamanoto	26	27.43	6,825
Joseph W. Machado	50	27.39	7,384
Sagara Bros.	25	27.38	7,623
Heidrick Bros.	76	27.34	7,841
Kraft Bros.	67	27.33	7,259
Fahn Bros.	20	27.32	7,316
Robert C. Gill	99	27.29	6,850
J. Dudley Stephens & Son	32	27.26	8,282
Arthur N. Oji	44	27.25	6,595
Tsutsui Bros.	21	27.20	7,529
Jerry V. Little	27	27.16	7,420
California Packing Corporation	62	27.14	6,942
William Holdener	35	27.12	7,160
Richard Moore	97	27.03	7,639
Oji Bros., Uno & Terao	57	26.99	6,969
James D. Ward	18	26.90	6,515
John E. Jackson	22	26.85	7,260
J. H. Braden	38	26.78	6,583
M. B. Avilla	85	26.73	6,715
Darrell T. Day	59	26.66	6,414
Henry Rehrmann	109	26.65	6,998
Taylor Bros.	57	26.65	6,535
James I. Tadlock	53	26.63	6,849
M. Anchita	74	26.60	7,799
Keith B. Nelson	10	26.52	7,887
C. E. Frazier	51	26.47	6,856
Wallace Bros.	147	26.42	6,859
Glenn E. Morris	72	26.37	7,879
Max Toledo & Son	154	26.33	5,540
George Ooki	22	26.27	6,867
Chuck Sakurada	20	26.24	6,403
John M. Lear	91	26.19	6,275
Robert Leslie Button	72	26.16	6,911
Lloyd M. Eveland	99	26.15	5,978
Hamatani Bros. Farm	52	26.12	7,000
C. Warren Morris	159	26.11	7,170
William B. Schoeningh	36	26.08	6,703
Keith B. Nelson	103	26.06	7,396
Buchignani & Hughes	147	26.05	7,924
Rudy Howald	25	25.97	7,053
Rosh Herota	28	25.92	6,464
A. E. Holly	58	25.85	6,085
Orth Bros.	66	25.80	6,801
Liberty Farms Co.	35	25.63	8,145
Wallace L. Turner	39	25.61	6,531
M. Romani	117	25.60	7,578
Floyd E. Warner	66	25.58	7,198
Giger Bros.	7	25.57	6,894
George T. Dakuzaku	26	25.51	7,980
Wallace Bros.	151	25.44	7,886
Wm. R. Lider	20	25.43	7,960
Timothy & Blickle	27	25.37	6,845
Harlan & Dumars	103	25.32	6,563
John E. Jackson	24	25.30	6,239
M. B. Flores	32	25.20	6,411
Erle E. Santens	90	25.11	7,869
Nishikawa Bros.	60	25.11	6,373
James I. Tadlock	33	25.04	7,016
G. M. Struve & Son	153	25.03	7,354

AN ERROR — WE'RE SORRY

In the 1960 Honor Roll for District 1—Salinas—the seventh entry stated that T. C. H. Co. had produced 21,923 pounds of sugar per acre. This is not a new world's record; just a typo. It should have read 12,923 pounds of sugar per acre.

HARVESTER MANUFACTURERS

Continued from Page 26

under the screen to carry the clods away and prevent them from being dropped back into the bin. The arrangement of the cleaning screen and the dirt chutes is shown in the photographs below."

"During the spring harvest in the Woodland area a Gemco cart harvester using the square roll screen was operated extensively in various heavy soil areas. The amount of dirt reduction improvement in the machine over using the standard potato chain-type upper cross conveyor was considerable. For example, where the total first tare in a beet load might have been 2500 lbs., the tare dropped to 830 lbs. In every instance where we made a comparison between the two types of conveyor, the dirt reduction was never less than 40%."

"An unexpected dividend was also gained from the use of this new screen design wherein it was noted that it tends to deliver the beets into the bin tail up. We feel that much tail breakage from the drop into the bin is prevented because of this."

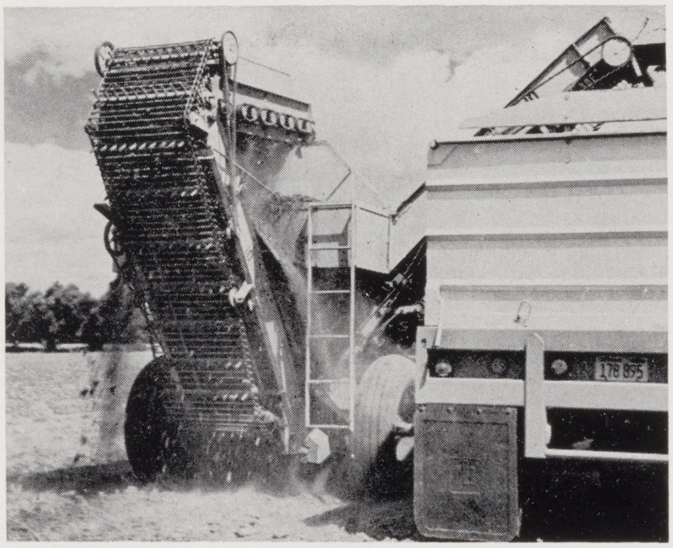
"As a result of this development work, we are pleased to announce that the square roll upper cross conveyor will be offered as optional equipment on our cart type Gemco harvesters for delivery to California."

THE JOHN DEERE 223 BEET HARVESTER is a tank-type 2-row litter-loader, digging beets with the Oppel-type lifter wheels, which John Deere is licensed to build. At present, it is not planned to distribute this machine in California.

Mr. M. J. McNamara, Products Information Manager, John Deere Des Moines Works has this to say:

"The mechanical cleaning of beets is accomplished in the 223 Beet Harvester in the follow way:

1. Wheel type lifters operate as shallow as possible, to handle a minimum of dirt.
2. Rotating paddles or high-speed flails deliver the beets to the cleaning bed from the digging wheels. The operation of the flails and paddles also eliminates dirt from the beets by breaking up clods and trimming loose tops from the beets.
3. Five-point star wheels with a camming action crush clods and save the beets.
4. Delivering the beets from the horizontal conveyor to the bin drops the beet and remaining dirt. This fall further eliminates dirt frfom the beets.
5. Bin unloading with the elevator and bin bottom chain further eliminates trash and dirt. The bin bottom chain provides continuous rubbing of beets as they are unloaded. In the elevator, rolling and tumbling of the beets crush the dirt as unleading occurs.
6. Truck elevator grate is free to move up and down each time an elevator flight passes through it. This action continually releases loose leaves and trash and prevents dirt build up at the bottom of the elevator.
7. No manual sorting of beets is necessary." [in normal soil conditions; a platform with safety railing is provided so that manual sorting can be used under exceptionally cloddy conditions].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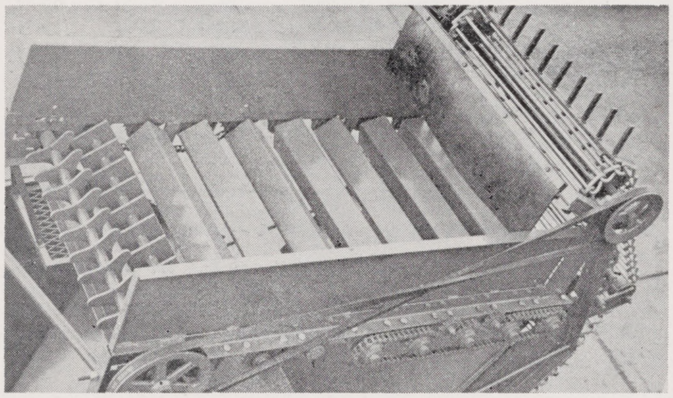
THE GEMCO 2-row harvester. Note the two streams of dirt falling from the multi-roll screen.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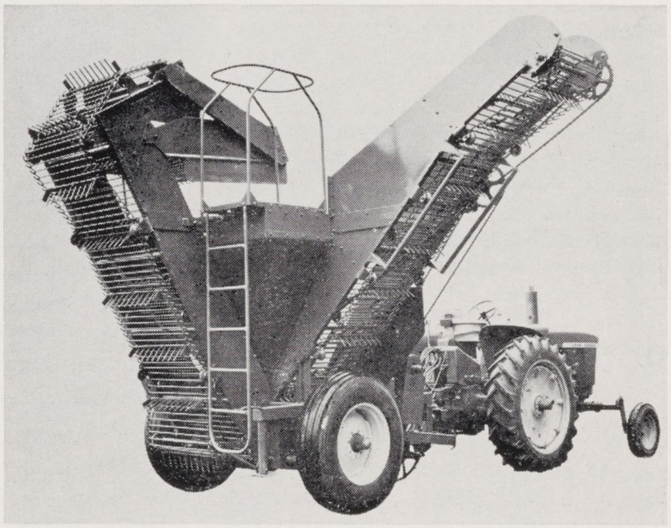
THE MULTI-ROLL SCREEN removes as much as 67% of all dirt delivered by the elevator.


John Deere Photo 47

THE JOHN DEERE 223 Beet Harvester is a tank-type 2-row lifter-loader with provision for hand sorting in excessively cloddy fields.

FACTORY 4 UNDER CONSTRUCTION

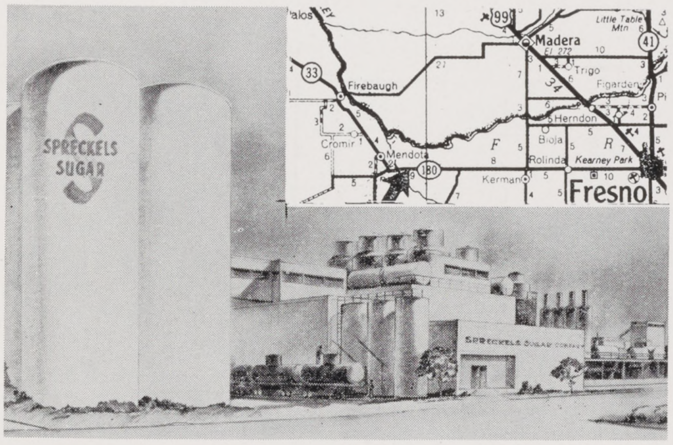
SEVERAL WEEKS AGO the Spreckels Sugar Company announced its plans to construct a beet sugar factory in the San Joaquin Valley. This factory will be located about thirty miles west of Fresno.

The Fresno factory will slice about 4,000 tons of beets and produce in excess of 1,000,000 pounds of sugar daily. This additional capacity represents a 27.5 percent increase over the combined capacity of the present factories.

Some idea of the magnitude of the undertaking can be found in the estimated cost of construction of $16,000,000, and in the two years required to complete the job. It is anticipated that the first beets will be delivered to the factory for processing in the summer of 1963.

The new Spreckels facility will incorporate a number of new ideas and concepts in beet sugar processing. Much of the construction will be exposed-type without conventional housing. Beet storage will be radically different than that employed in existing factories, and a new hydraulic method to move beets from the storage area will be installed. A process for re-using factory lime will be incorporated, and recycling will reduce the requirements for lime-rock to almost nothing. The installation of completely automatic centrifugals will make this the second U.S. beet sugar factory so equipped, the perior sugar quality will be assured by the use of period sugar quality will be assured by the use of the Continuous Adsorption Process first tested and proved at the Woodland plant. The plant is designed particularly to supply the ever-growing market for bulk and liquid sugar, so that most storage will be in bulk form.

When operating, the factory will provide employment for nearly 300 workers. Offices at the factory will accommodate personnel from the operating, accounting and agricultural departments. The entire company is looking forward to the summer of 1963 when this facility is completed.



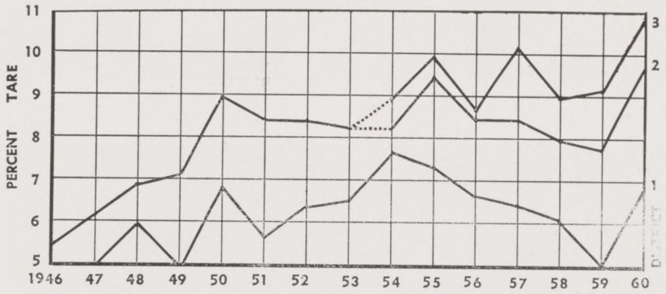
48

ARCHITECT'S SKETCH of Factory 4. Insert map indicates location.

THE CLEANER THE BETTER

A PRE-HARVEST ISSUE of the Sugar Beet Bulletin could hardly go to press without stressing the importance of clean beets.

The 1960 crop harvest was beset with many problems which contributed to a higher than normal tare on beets delivered to the company. The resulting clean beets record was hardly an enviable one. We recognize that some of the elements in last year's harvest were beyond the control of the beet farmer but we must recognize that trash and dirt hauled to our receiving stations created many problems for everyone. We are certain a better job of harvesting could have been done. We are equally certain that growers know when their deliveries are improperly cleaned and that most growers know how to materially improve deliveries containing excessive dirt and trash.

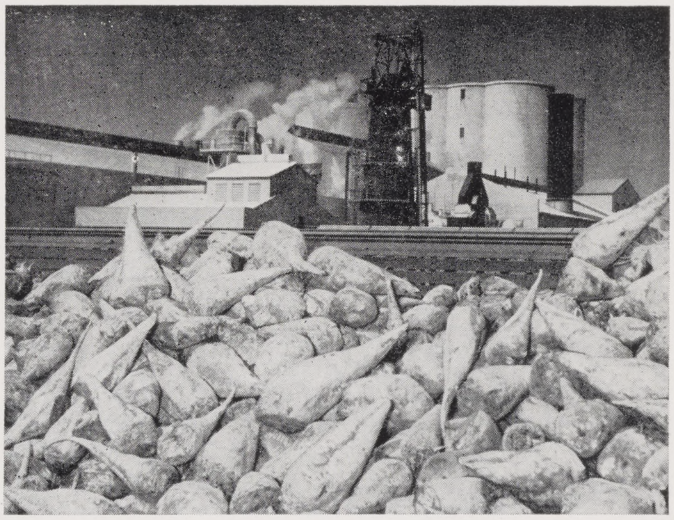


49

LOOK AT THE RECORD! Tare percents rose steadily from 1946 to 1955 when a downward trend was recorded, then in 1960 tare reached almost an all-time high in all districts.

With the 1961 crop harvest already upon us, we urge you individually to resolve to deliver cleaner beets. We suggest you will save money by leaving a maximum of the harvest tare in the field. Our field staff is continually ready to help with this and other harvest problems in any way possible.

Give the quality of your beet harvest your close attention. Deliver your beets properly topped and free of foliage, trash and soil. Remember every



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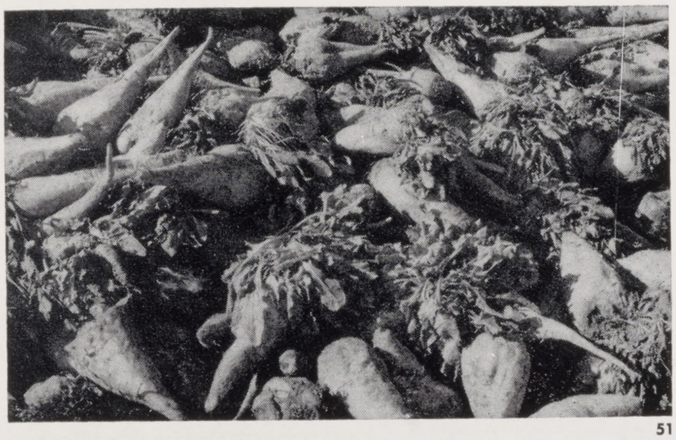
CLEAN BEETS CAN BE delivered. This photo, taken in 1959, proves it.

pound of foreign material loaded into your truck represents a cost that can be avoided. Bring them in clean, the cleaner the better.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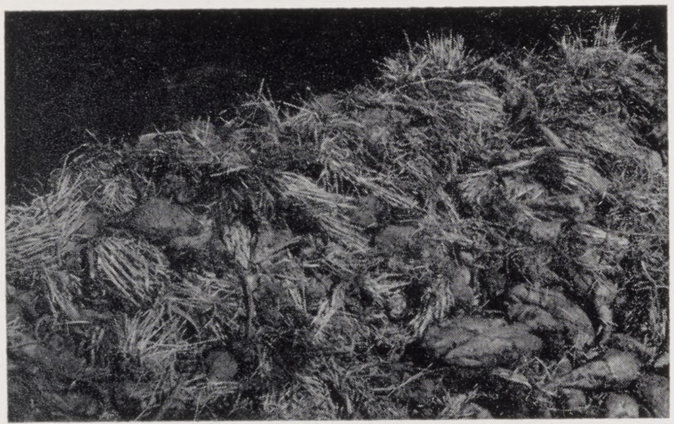
THERE IS NO SUGAR IN TOPS.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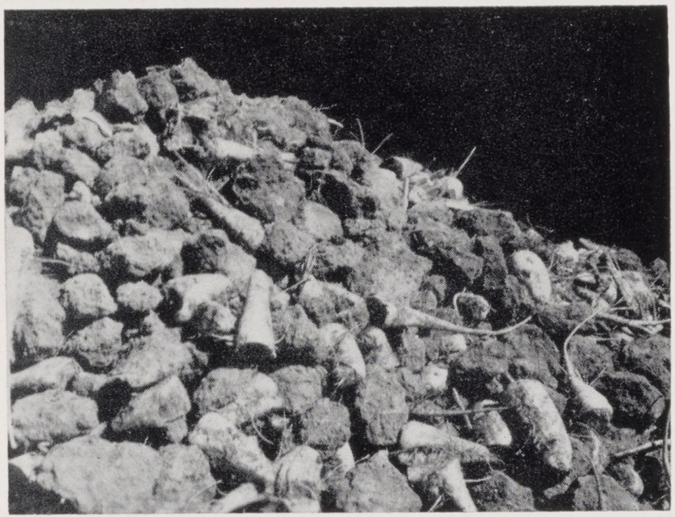
THERE IS NO SUGAR IN TRASH.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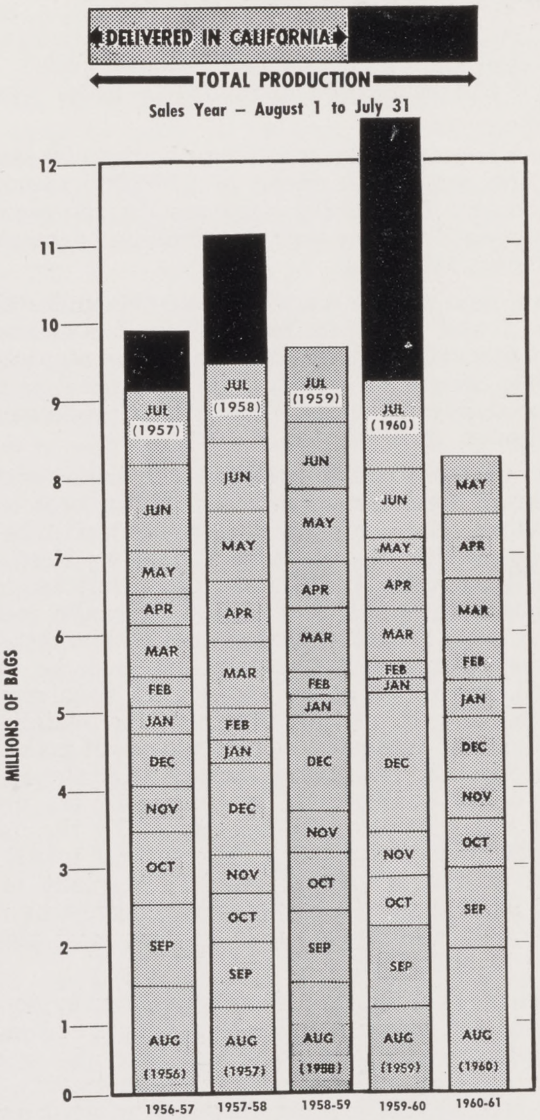
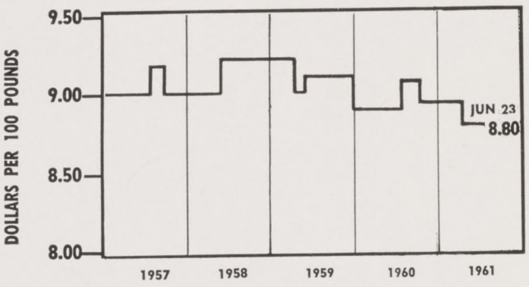
THERE IS NO SUGAR IN CLODS.


PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA


QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco

54

The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
Mention of specific methods, devices and implements does not constitute an endorsement by the Company.
All photographs by the editor unless otherwise indicated.

AUSTIN ARMER, EDITOR SPRECKELS SUGAR COMPANY WOODLAND, CALIFORNIA
SPC - DAVIS

OC 23 '61

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

SPRECKELS SUGAR BEET BULLETIN

VOL. 25 SEPTEMBER-OCTOBER, 1961 NO. 5

55

BREAKING GROUND

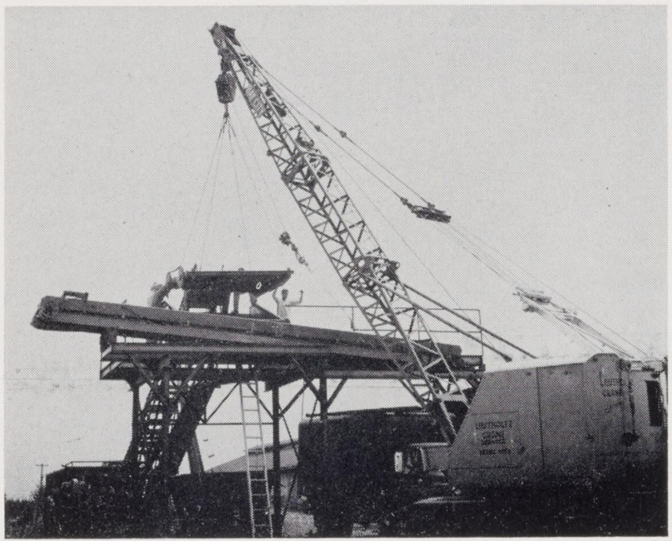
for a new receiving station at Elmira took place on September 5. This new station will be completed in time to receive beets during the 1962 spring harvest. It will be the newest receiving station specially designed and strategically located to serve growers for the Spreckels Sugar Company.

TWO NEW RECEIVING STATIONS WILL SERVE SPRECKELS GROWERS

ACREAGE INCREASES in sugar beet plantings for Spreckels Sugar Company have made necessary the building of two new receiving stations.

The first of these stations to be completed is at Isleton. This location has been the site of a Spreckels receiving station for many years, but a new facility has been installed to improve service to growers and to speed the receiving and cleaning of beets from this important section.

The Isleton station has been tailored to the particular local conditions. A special screen has been designed to comply with Isleton's unusual condition of peat and semi-peat soils, together with a great deal of dried sugar beet foliage. Both rail cars and transport trucks will be accommodated at the new Isleton station.



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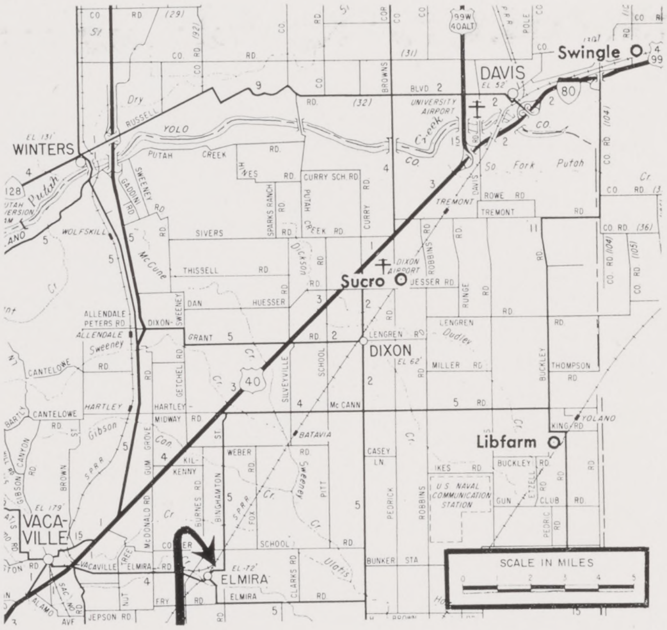
A NEW RECEIVING STATION at Isleton was completed on September 15. A special screen was installed to comply with local soil conditions.

A completely new location is the site of a station being built at Elmira. This station is located on the Southern Pacific tracks just north of the city limits of Elmira, in Solano County. It will accommodate beets from the rapidly growing surrounding acreage, and will relieve the load at Sucro, which is located 9½ miles northeast.

The Elmira station is unique in that it has been designed from the ground up by the Agricultural Engineering Department of Spreckels Sugar Company. The machinery is being built entirely in local shops.

The Elmira site was selected because of its appropriate location with regard to surrounding sugar beet acreage. Another reason is the imminence of new sugar beet acreage which the Solano Irrigation District will bring under irrigation. The mechanical features of the station have been designed with a view toward high hourly capacity so that rail cars can be loaded in a minimum of time. Provision for loading transport trucks has been made in order to meet peak deliveries of beets.

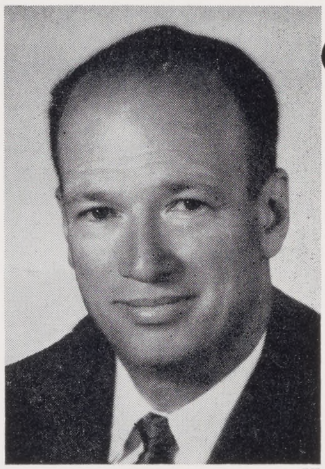


58

ELMIRA, on the Southern Pacific main line, is the site of Spreckels' newest receiving station. This map shows the relation of Elmira to existing stations at Sucro, Swingle and Libfarm.

FRED BALLOU NAMED DIRECTOR

FRED H. BALLOU, JR. was elected to the Board of directors of Spreckels Sugar Company, filling the vacancy caused by the recent death of attorney Roland C. Foerster, a member of the Board since 1950.



57

FRED H. BALLOU, JR.

Mr. Ballou became Vice President in Charge of Factory Operations for the Spreckels Sugar Company in 1953. A graduate of the University of Colorado with a B.S. Degree in 1936, Mr. Ballou served with the British Columbia Sugar Refining Company, Ltd. and Canadian Sugar Factories, Ltd. before joining the Spreckels Sugar Company Engineering Department in 1937. The new member of the Spreckels Board of Directors is a member of the American Society of Mechanical Engineers, and the American Society of Beet Sugar Technologist and the Engineer's Club of San Francisco.

ANOTHER NEW AREA THREATENED BY SUGAR BEET NEMATODE

By BERT LEAR and W. H. HART*

THE REPORT of the discovery of the sugar-beet nematode, *Heterodera schachtii,* in Tulare County during the summer of 1961 should be a source of concern to both sugar beet growers and sugar companies. This is especially true of those operating in the San Joaquin Valley, since prior to this discovery, Valley beet fields were thought to be free of this pest. Latest information from a joint survey now being conducted in the San Joaquin Valley by the state and county departments of agriculture and the sugar companies concerned shows at least 4 fields in Tulare County to be infested. In only one of these fields has the nematode infestation built up to populations high enough to cause plant injury. This is the field where poor growth of beets resulted in the first detection of the nematode. Many fields in this area have been exposed to contamination, and it appears probable that additional infested fields will be found. Continued cropping to sugar beets will result in population increases which will, in turn, make detection easier, either by actual crop damage or by soil sampling.

Many growers are aware that a similar situation existed in the Imperial Valley in 1957 when this nematode was first discovered in that area. More than 100 infested fields are now known as a result of a survey made by the sugar company which operates a plant there. This experience indicates strongly that an intensive survey during the next few years will disclose additional infested fields in the San Joaquin Valley. For this reason it is important to begin positive control programs in this area now to minimize both the buildup of nematode populations and subsequent crop losses.

The proposed control programs will benefit growers in areas where the infestation is relatively recent. Some portions will also be of value to growers in areas where the sugar-beet nematode has long been established.

Chemical control of the sugar-beet nematode has been attempted for more than 20 years. Nevertheless, there still are no chemical treatments which have proven to be economically feasible in the heavy soils of most California sugar beet lands. New chemicals are being tested each year, as well as different methods of application, and more efficient treatments may be forthcoming in the future.

Sanitary and cultural practices, at present, are the most effective means to combat this pest.

SANITATION

Since this nematode has almost no means of self-locomotion, it must rely on man to transport it from field to field or from one area to another. The cyst stage (brown dead bodies of the female which are filled with eggs) offers a convenient package for man to transport. This pinhead-size structure is easily carried in soil or debris clinging to machinery such as trucks, tractors, beet harvesters and planters. Any such equipment should be thoroughly cleaned before use in fields that have not been found infested. This applies to equipment moving between fields of the same ranch, as well as to equipment from outside the ranch or area. The most efficient method for cleaning such equipment is by use of steam which may be generated by a portable flash-steam generator such as used by garages for clean-

Continued on Page 40

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*Respectively, Associate Nematologist and Extension Nematologist, University of Californa, Davs.

EXTENSION SERVICE ISSUES NEMATODE WARNING IN TULARE COUNTY

FOLLOWING THE FINDING of Sugar Beet Nematode in two Tulare County sugar beet fields, a meeting was called and attended by representatives of sugar beet processors, State Department of Agriculture, County Agricultural Commissioner and the Farm Advisor's Office.

All who attended the meeting were in agreement as to the seriousness of the outbreak, and the urgency of preventing spread of Sugar Beet Nematode from the known focus of infection.

The first step was taken by the Extension Service, who circulated an informative letter to Tulare County growers. The letter follows:

Dear Sugar Beet Grower:

The sugar beet nematode was found recently in two fields in Tulare County—an area that we thought was free of this pest. The nematode may be present in other fields of the San Joaquin Valley, but damage may remain at low levels IF the growers practice crop rotation and take precautions to prevent further spread.

Learn about this important pest of the sugar beet, how it can affect you and what can be done about it.

The pest is a cyst-forming nematode that injures plants by feeding on their roots. The females are white, about pinhead size, and loosely attached to roots. The cysts are the brown dead bodies of the females filled with eggs that remain in the soil. The eggs are capable of hatching for 12 *years and more.*

The nematode is spread by cysts in soil on equipment, especially harvesters and trucks. In a field it is spread by cultivation, leveling, irrigation and harvesting.

Control. *Chemical control has not proven practical on most California soils. Crop rotation is the surest and most practical method of control. If the grower plants beets once every four years and eliminates weed hosts, he can grow sugar beets successfully on moderately infested fields and prevent the build up of the pest to crop damage levels in fields where the nematode has only recently been introduced.* Clean equipment thoroughly *preferably with steam, before using it on your land.*

More detailed information *concerning this pest is available from our office.*

Your Farm Advisor

PLANT CLIMATE IS AN INFLUENCE ON SUGAR BEET PRODUCTION

By DR. VARON JENSEN
Plant Physiologist, Spreckels Sugar Company

CLIMATE IS DEFINED as the average conditions of the weather over a period of years at specified locations. It is expressed in terms of temperature, air movement, total annual rainfall and its seasonal distribution, atmospheric humidity, and light intensity and duration. Therefore the concept of climate encompasses many of the major influences of the total environment in which plant and animal life grows and develops. The numerous responses to environmental conditioning of plant growth are so profound that environment has been pictured as the foster parent of plant life, and often a successful agricultural operation is entirely dependent upon the manipulation of a few environmental factors to the advantage of a growing crop. It is essential to note that the immediate environment of a growing crop (the *plant climate*) is often quite dissimilar to the climate described by Weather Bureau data collected in the same area. This is especially true in the case of irrigated agriculture which does not depend directly upon either local annual precipitation or favorable seasonal distribution of rainfall for crop production. In fact, in all the principal farming areas of California, atmospheric temperature is the major factor of climate which influences plant adaptation.

That climate is extremely variable, even over relatively short geographic distances, should be emphasized. Often we hear reference made to the "California climate." This term uses the concept of climate very loosely. For example, researchers at the University of California have tentatively described seven major climatic zones in the State[1]. Each zone is measurably dissimilar from all the rest and six of these zones are further divided into 2 or 3 subzones so that a total of 16 separate plant-climates are described for California. Further, the authors indicate that detailed study will probably result in the establishment of many additional subzones reflecting significant plantclimate differences.

An analysis of the areas of the state in which sugar beets are produced, along with attendant crop husbandry, will roughly indicate the range of adaptation for the beet plant. The sugar beet crop of California is produced in three general localities; the Central Valley, Coastal Valleys and the Imperial Valley. The fact that the sugar beet is a cool-season crop is emphasized by the realization that it is managed as a fall-planted, winter-time crop in the Imperial Valley. Likewise, the winter and spring seasons of the San Joaquin Valley are utilized in order to best fit the beet crop into its cool-season requirement.

Level of production is a naturally integrated measure of the suitability of an environment for plant growth and development. Table I has been prepared to compare yield data from three major beet producing areas of the state. (See bottom of page.)

It is granted that many production variables, in addition to climate, are present in the districts listed in Table I. However, it is suggested that variables, other than climate, tend to balance each other when mean data of large production areas are generated. Therefore, the data illustrate a yield advantage in favor of the Coast Counties district over the Central Valley areas. We may assume, therefore, that the former district has a climate to which the sugar beet is better adapted than does the latter.

"MORE SUGAR PER ACRE"

It is also significant to note that beets of higher quality (higher sugar content) are produced in the cool climate of the Coast Counties. This point deserves further emphasis when it is noted that the importance of beet crop yield in terms of *sugar yield per acre* is often overshadowed by concern with yield expressed as tons of roots per acre. Gross returns for a delivered beet crop are based on the sugar content and the tonnage delivered. Computations involving tonnages and sugar contents have been utilized to construct a chart illustrating the relationship between tonnage, sugar content and yield of sugar per acre. (See top of next column.)

Study of the chart will reveal that many combinations of tonnage and sugar content will produce the same yield of sugar per acre. Further consideration of all costs of producing and delivering a beet crop will point out the real advantage of high quality beet production. High quality beets will usually be shown to produce larger net returns because of the interaction between gross return and costs of production.

DO SOMETHING ABOUT THE CLIMATE

Now let us consider possibilities for manipulating sugar beet plant climate with the aim of producing

TABLE I. Production Data for Sugar Beet Processing Campaigns in Three California Districts. 1955-1960

Production Year	SACRAMENTO VALLEY Tons Roots/Ac.	SACRAMENTO VALLEY Sugar Content %	CENTRAL COAST COUNTIES Tons Roots/Ac.	CENTRAL COAST COUNTIES Sugar Content %	SAN JOAQUIN VALLEY Tons Roots/Ac.	SAN JOAQUIN VALLEY Sugar Content %
1955	19.8	14.9	21.7	15.4	20.5	14.7
1956	20.2	15.1	23.4	15.3	19.8	14.7
1957	23.8	13.5	25.1	15.4	22.5	13.8
1958	15.9	14.8	23.8	14.2	18.0	14.5
1959	25.4	15.4	29.7	15.4	22.9	14.9
1960	20.8	13.3	26.3	15.4	17.8	13.9
MEAN:	20.98	14.50	25.0	15.18	20.25	14.42

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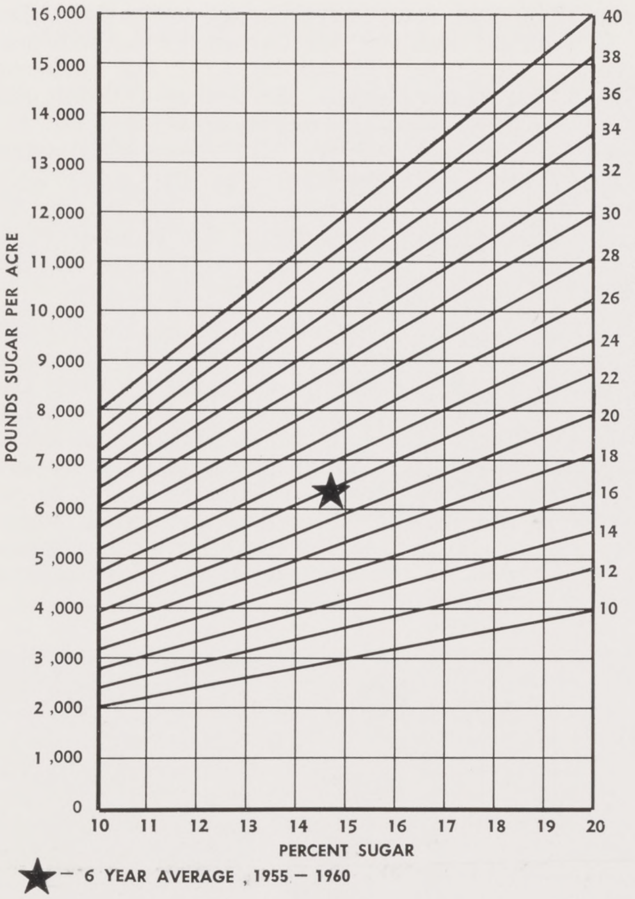
[1] Kimball, M. H. and F. A. Brooks. Plantclimates of California. California Agriculture 13(5): 7-12. 1959.



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SUGAR PER ACRE for any tonnage and sugar percentage may be found on this chart. To find sugar per acre, find the line designated "Tons Per Acre". Follow this line down to its intersection with "Percent Sugar". Follow the horizontal line left from this intersection to find "Pounds Sugar Per Acre".

a better quality, more lucrative crop, regardless of the area of production in the State. The influence of high atmospheric temperature is a subject of interest in this regard. The effects of drought upon beet plant growth and sugar storage are striking. Work with a wide variety of plants has shown that photosynthetic efficiency of succulent leaves is immediately reduced when wilting occurs. At the same time, elevated air temperature induces higher rates of respiration in plant tissue. The result is that the demands of the plant for respiratory energy may exceed the ability of wilted leaves to produce chemical energy via the photosynthetic mechanism and no energy is available for storage in the root. Sugar stored in the root tissue of a beet is simply a fund of chemical energy in excess of the plant's needs for growth, development and respiration.

The best possibility for altering the temperature of the immediate atmosphere within which a crop grows is through a judicious irrigation program. When a complete leaf canopy has been produced by the crop, air temperature underneath the leaf canopy and a few inches above a moist soil surface may be several degrees different from the temperature within a weather station 40 inches above the ground level. Also, the moist soil provides available water for metabolic needs of the plant and for transpiration which can produce a cooling effect on the leaf blade itself.

STUDIES ARE UNDER WAY

Experimental work being conducted currently in the San Joaquin Valley is designed to measure the main effects and the interactions between soil fertility and irrigation as they influence sugar beet growth and quality. Early harvest data have revealed some of the relationships present and preliminary conclusions are available.

1. When high rates of fertilizer application are employed (240 lbs. Nitrogen + 1 Ton of phosphated gypsum per acre), it is essential that a frequent irrigation interval be established at about 10 days or less in order that the plants may utilize the min-

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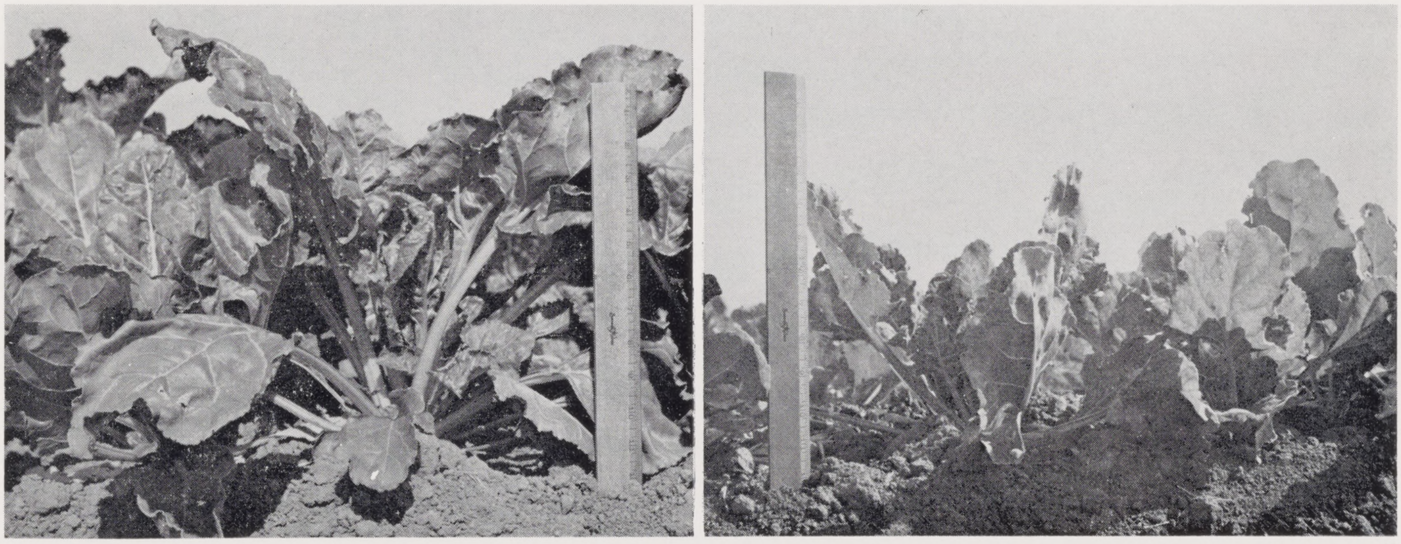


60

ADEQUATE IRRIGATION is essential if the beet plant is to fully utilize the soil nutrient. The two rows illustrated above were in adjacent fields; both had the same fertilizer treatments, and both were irrigated for germination at the same time.

The beets on the left were irrigated 48 days after emergence; those on the right received no second irrigation.

SUGAR BEET FIELD DAY AT U. C. DAVIS

SEPTEMBER 8th was the occasion of the College of Agriculture annual Agronomy Feld Day—this year devoted entirely to sugar beets. Dr. Merton Love, Chairman of the Department of Agronomy welcomed a record audience of 270 sugar beet growers and processor representatives.

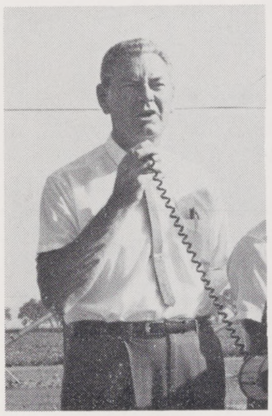
The morning program comprised tours of experiments in progress. These included:

1) Pot Studies Relating to Water, Nitrogen and Climate (being conducted by Dr. R. S. Loomis)
2) Irrigation and Nitrogen Fertility (being conducted by Dr. L. D. Doneen and Dr. R. S. Loomis)
3) Date of Planting and Aphid Transmitted Viruses (being conducted by Dr. F. J. Hills, J. L. Reed, D. H. Hall and Dr. W. H. Lange)
4) Green Manures and Crop Rotation (being conducted by Dr. W. A. Williams)

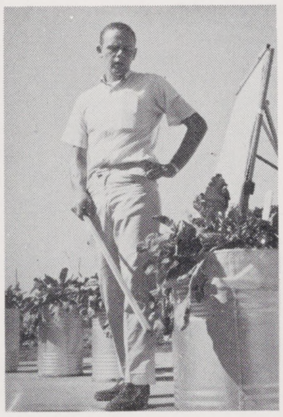
The afternoon program was devoted to two panel discussions and four individual presentations. Dr. D. G. Aldrich, Dean of the College of Agriculture, gave the welcoming address. Dr. L. C. Foy spoke on Weed Control, Dr. John S. McFarlane (USDA, Salinas) spoke on Variety Improvement, and Dr. Albert Ulrich spoke on Mineral Nutrition and Climate.

The first panel discussion was concerned with virus diseases and was moderated by Dr. L. D. Leach. Participating were Dr. C. W. Bennett (USDA, Salinas), Dr. J. E. Duffus, Dr. John S. McFarlane (USDA, Salinas) and Dr. W. H. Lange.

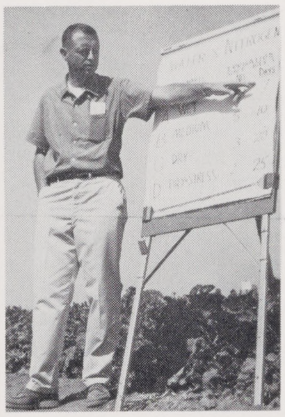
The second panel discussion was on the subject of practices for maximum production and was moderated by Dr. R. S. Loomis. Participants were Dr. Albert Ulrich, Dr. D. G. Aldrich, W. D. Pruett, Dr. W. A. Williams and Dr. John S. McFarlane, Audience participation in this discussion was lively and interesting. The audience participants tended to redistribute the weight of various factors in sugar beet crop production, laying more stress on climate and less stress on the adverse effects of virus and other diseases.



DR. R. MERTON LOVE



D. J. NEVINS



DR. R. S. LOOMIS

DR. F. J. HILLS

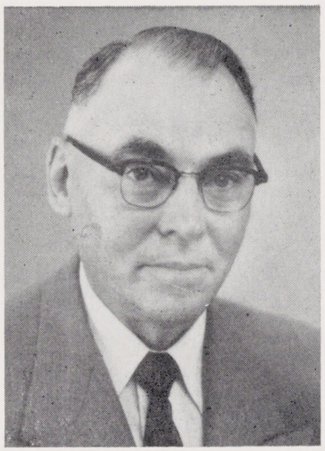
61

DR. W. A. WILLIAMS

62

TRACTOR-TRAIN comfortably accommodated the audience, shuttling small groups from field to field, where experiments in progress were explained.

USDA SUGAR SCIENTIST RETIRES



63

DR. HEWITT M. TYSDAL

Dr. Hewitt M. Tysdal, Chief, Tobacco and Sugar Crops Research Branch of USDA's Agricultural Research Service, retired July 14, after more than 33 years service in the U. S. Department of Agriculture.

Dr. Tysdal's earlier recognition was in the field of forage crops research, particularly in alfalfa breeding conducted at Lincoln, Nebraska, and at Beltsville, Md.

He contributed to the development of Ranger alfalfa, which led to an award by the Certified Alfalfa Seed Council.

In 1948, he transferred to the Rubber Project at Salinas, California, and in the 6 years on this work was laregly responsible for many new strains of guayule as a potential source of rubber.

Dr. Tysdal transferred from Salinas to Beltsville in 1954 to accept the overall responsibility for leadership on sugar investigations, and when the Tobacco and Sugar Crops Research Branch was organized in 1957, became Chief of the Branch. In these latter assignments his thorough background and high standards of research have been reflected in the discharge of his responsibilities in a manner that contributes to the traditional standards of research maintained in the Agricultural Research Service.

DR. TYSDAL'S SUCCESSOR NAMED

64

DR. THOMAS THEIS

Dr. Thomas Theis was appointed successor to Dr. Hewitt M. Tysdal effective July 14, 1961. Dr. Tysdal, Chief of the Tobacco and Sugar Crops Research Branch, who is retiring to take up residence in California after 33 years of Department service.

Dr. Theis is a graduate of the University of Wisconsin where he received his B.S. degree in 1943 with a major in agricultural bacteriology. After nearly 3 years in the U. S. Navy with considerable time and activities in the Pacific Islands area, he returned to Wisconsin and completed his Ph.D. with a major in plant pathology in 1949. On completion of his degree, he joined the research staff at the Federal Experiment Station, Mayaguez, Puerto Rico. His work there involved pathological investigations on a number of different plants including banana, Cinchona, black pepper, forage crops, cereals and vegetables.

In October 1953, Dr. Theis was made Assistant Officer in Charge of The Federal Experiment Station at Mayaguez, which position he held until his transfer to Beltsville as Assistant Chief of the Tobacco and Sugar Crops Research Branch in 1961.

PLANT CLIMATE

Continued from Page 37

eral nutrients within the soil and experience maximum growth rates.

2. Within plots fertilized with either 240, 180, 130, or 50 pounds of nitrogen per acre and harvested August 10, the sugar content of the beets was 13.0%, 13.9%, 14.3% and 14.9%, respectively. The highest tonnage was produced in the plots receiving 240 lbs. of Nitrogen but the sugar content advantage in favor of the beets from the other plots was sufficient to offset the tonnage advantage of the former plots. Only in the plots receiving 50 lbs. of nitrogen was the sugar yield substantially reduced as a result of low tonnage.

3. Under the conditions of the experiment, the best yields of high quality beets were produced when the crop was fertilized with 130 or 180 lbs of Nitrogen and irrigated approximately every 10 days. A cost analysis of the final results of this experiment will be made in order to highlight the economics of the several procedures.

4. The data demonstrate again that excessive soil nitrogen depresses beet quality. For example, average sugar content was reduced from 14.3% to 13.0% by the application of 240 lbs. of nitrogen instead of 130 lbs. This situation developed under the influence of a schedule of frequent irrigation. Less frequent irrigation accentuated this same relationship.

Measures of the effect of variable fertility and irrigation upon plant climate in the San Joaquin Valley were not made during the conduct of the study mentioned. However, the plants responded to the several treatments in relation to the suitability of the complete environment to plant growth; and because differences in production per unit time were measured, it may be assumed that the treatments were effective in altering the environment perceptibly.

In summary, sugar beet production measured as a yield of sugar per acre is a good index of the suitability of the immediate environment for plant growth and sugar storage. Under irrigated agriculture, opportunities for altering plant climate to the advantage of the growing crop are maximized; and, when crop management is aimed toward the production of high tonnages of high quality roots, net returns are maximized as well.

ANOTHER NEW AREA THREATENED

Continued from Page 35

ing engines. If steam is not available, a strong force of water from a hose is almost as effective.

CULTURAL PRACTICES

CROP ROTATION

The proper rotation of crops has long been recognized as valuable in combatting this nematode. A rotation properly designed to take into account the degree of infestation of a field offers the grower the best method of control currently available. In a field where nematodes have not been detected, even though it actually may be lightly infested, populations may never increase to injurious levels if beets or other host crops are not grown more often than once in three years. In known infested fields where small areas of injury occur, the rotation should not include beets more often than once in every 5 or 6 years. In the rotation it is important that other host crops not be grown. Host crops, other than sugar beet, include table beet and swiss chard; all of the cabbage family including broccoli, brussels sprouts, cauliflour, cabbage, turnip and radish; and rhubarb. This nematode also reproduces on tomato but this crop is not a good host and itself is not affected, based on experimental work at the University. Good weed control should also be attained since many weeds are hosts of this nematode. Some weed hosts include the mustards, black nightshade, lambsquarter, knotweed, purslane, chickweed, wild radish, and, of course, wild or volunteer beets.

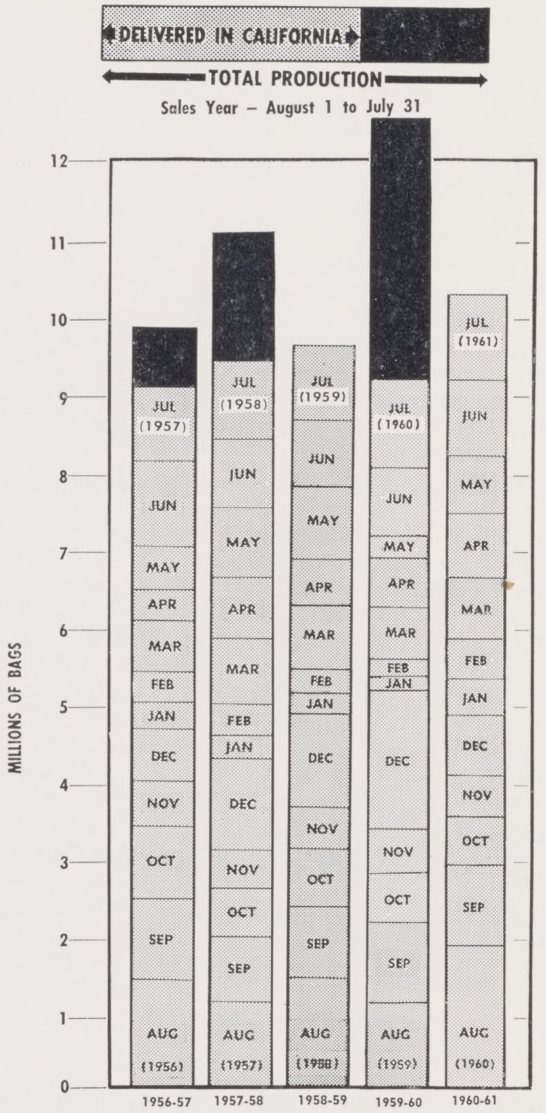
The value of crop rotations was considered sufficiently important in England, as early as 1935, for sugar companies to include clauses in grower contracts which required observance of certain rotations. Sugar companies in California are as much concerned as growers that fields should remain economically productive despite nematode infestations.

EARLY PLANTING

In some areas of the State, early plantings have been beneficial in allowing beets to become established before soil temperatures become sufficiently warm for much nematode activity. This practice may be limited in value because of other factors which govern the date of planting.

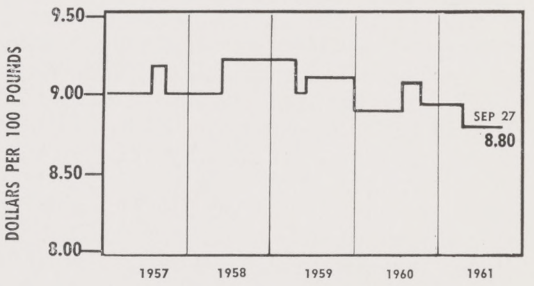
Maintaining economic production of sugar beets in areas infested with the sugar beet nematode, as well as taking all reasonable efforts to prevent or delay introduction of this nematode into new areas, should be the concern of both the growers and the sugar companies. Economic production can be maintained in fields when the nematode is present, but requires careful planning by all concerned to keep nematode populations as low as possible.

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
Mention of specific methods, devices and implements does not constitute an endorsement by the Company.
All photographs by the editor unless otherwise indicated.
AUSTIN ARMER, EDITOR
SPRECKELS SUGAR COMPANY
WOODLAND, CALIFORNIA
SPC - DAVIS

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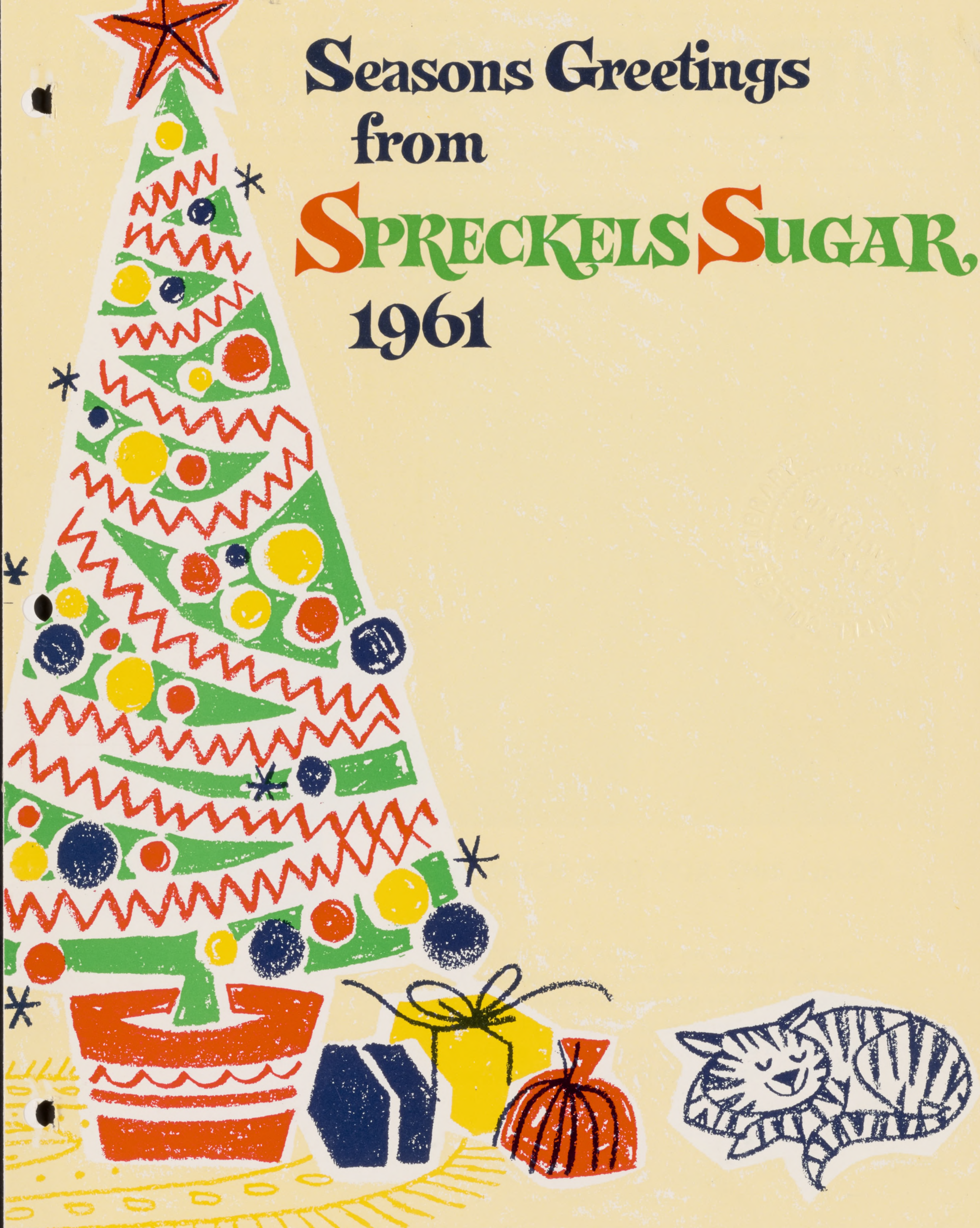
Seasons Greetings from SPRECKELS SUGAR, 1961



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PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

SPRECKELS SUGAR BEET BULLETIN

VOL. 25 NOVEMBER-DECEMBER, 1961 NO. 6

HOW MUCH SEED FOR THIS FIELD?

POUNDS PER ACRE is an outmoded unit of seeding rate; its value depends on size of seed and row spacing — all variable. **SEEDS PER FOOT** is a true measure of planting rate. How to determine number of seeds per foot is discussed on page 42.

Hartnell College Library
Salinas, California

BEET SEED--SIZE, DISTRIBUTION AND SEEDLING STANDS

By GEORGE W. WHEATLEY
Agronomist, Spreckels Sugar Company

UNTIL ABOUT 1935, most of the beet seed planted in the United States was whole seed, just as it was imported from foreign seed producers. Seeding rates approximated 20 pounds per acre of this whole seed. As farming methods and planters improved, the need arose for more uniform seed size. To provide this, sugar companies began to process beet seed. This processing consists of polishing the rough surface from the whole seed, then removing, by screening and aspiration, small seeds and seed pieces. By this method a seed is produced which is more uniform in size and generally of higher germination ability than the whole seed. Since 1948, all seed issued by Spreckels Sugar Company has been between 7 and 10 sixty-fourths of an inch in maximum diameter. With this seed, planting rates now range between 3 and 10 pounds per acre with an average of about 7 pounds.

Since beets are planted almost throughout the year in California, environmental conditions for stand establishment vary from excellent to poor. This situation is responsible for the wide range in planting rates in California. Numerous tests on seeding rates, however, have indicated that seeding rates under many conditions could be reduced without danger to the establishment of a stand of seedlings.

WHAT IS A SATISFACTORY STAND?

It would be difficult to recommend any one seeding rate that would provide every grower with an adequate stand of sugar beet seedlings. The most desirable final stand of beets would be a single beet every 6 to 9 inches within the row, uniformly distributed throughout the field.

But planting to a final stand is not practical—additional seeds must be planted as insurance against partial emergence. Weeds will also inevitably emerge. Therefore thinning the emerged seedlings is unavoidable, and the stand before thinning should not be less than about double the wanted final stand of 6 to 9 inches between beet centers. That would mean a *pre-thinning* stand of seedlings spaced 3 to 4½ inches apart. But there must be more seeds planted than seedlings wanted, because germination is never 100%. Assuming 66% germination, the 3 to 4½ inch spacing becomes 2 to 3 inches *between seeds planted.* That means between 4 and 6 *seeds per foot.*

If the pre-thinning stand of seedlings is evaluated in number of *beets per foot,* a better criterion for discussing planting rates may be *seeds per foot* of row, rather than pounds of seed per acre.

Table I shows the approximate pounds of seed per acre that would be planted at different seed spacings (seeds per foot) for both multigerm and monogerm seed and for row spacings of 20 inches (2 rows on 40 inch beds) and 30 inch single rows.

Table 1 shows that these various "Seeds per Foot" values mean in terms of Pounds per Acre. It also shows that monogerm seed (with more seeds per pound) requires less poundage per acre than multigerm seed for any given seed spacing.

The number of seeds per foot to plant should be determined after evaluating such things as the condition of the seed bed, soil physical condition and possibilities of crusting, the depth the seed is to be planted, the soil moisture conditions at planting time, the time of the year the planting is made and the potential weed problem. In other words, the considered judgement of a skilled farmer who knows his land and climate.

Satisfactory performance of mechanical thinning is dependent upon the nature of the initial stand in the field. The initial stand should not be so heavy that clumps of beets are left, nor should it be so sparse that excessive gaps without beets are left.

As this need for a more uniform stand has increased, growers have begun to use planters capable of distributing the seed down the rows with more precise spacing.

PRECISION PLANTERS

Unfortunately, present planting devices do not have adjustable cell size openings to compensate for

TABLE I

	POUNDS PER ACRE—MULTIGERM*		POUNDS PER ACRE—MONOGERM**	
Seeds Per Foot	20 inches Between rows	30 inches Between rows	20 inches Between rows	30 inches Between rows
4	2½ to 3	1¾ to 2¼	1½ to 2	1 to 1½
5	3¼ to 3¾	2 to 2½	2¼ to 2¾	1½ to 1¾
6	3¾ to 4½	2½ to 3½	2¾ to 3½	1¾ to 2¼
7	4¼ to 5¼	3 to 4	3 to 3¾	2 to 2½
8	5 to 6	3½ to 4½	3½ to 4¼	2¼ to 3
9	5¾ to 6¾	3¾ to 4¾	4 to 5	2½ to 3¼
10	6½ to 7½	4 to 5	4½ to 5¼	3 to 3¾
12	7½ to 9	5 to 6½	5½ to 6½	3½ to 4½

* Approximately 38,000 seeds per pound, 7/64" to 10/64" diameter.

** Approximately 59,000 seeds per pound, 7½/64 to 9½/64" in diameter.

the differences within the range of commercial beet seed sizes.

Another adverse factor against precision planting is the increased speed at which tractors are driven when attached to sugar beet seed planters. The precision type planters in service today can do an acceptable job of distributing seed down the row to a pre-determined spacing only if driven well below 4 miles per hour—preferably not over 3 miles per hour.

Metering devices in all planters should have seed openings large enough to allow free feeding of the largest components of the seed, yet not to allow multiple cell fill of the smaller components of the seed. To accomplish this, plate type planters must have a 12/64 inch opening in the seed plate to allow the seed to enter the seed plate cell or metering mechanism readily. The lower side of the seed cell of the seed plate should be taper-reamed to 13/64 inch, so the seed can leave freely and not be crushed or shattered as it is pushed out by the seed knocker. If the lower side of the seed cell is tapered too much, multiple cell fill is increased and the precision is lost. Comparable sized openings can be secured for most planters in use to increase the precision in planting. Even Planet Jr. planters can be adjusted to distribute seeds more uniformly than is generally being done.

MECHANICAL THINNING

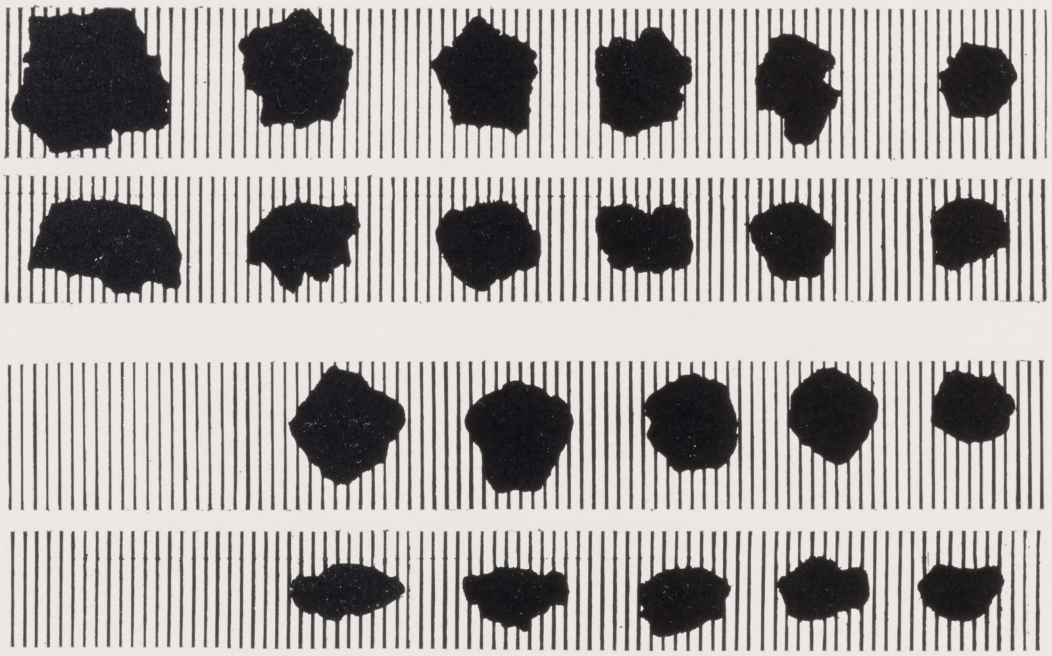
In California, labor has been relatively plentiful. Most growers have continued to remove weeds and extra beets by hand, even though this operation is expensive. With the increasing costs of labor and the difficulty with which it can be obtained, mechanical stand reduction is becoming necessary.

To do a satisfactory job of stand reduction with any mechanical device now on the market, there must be, previous to the thinning operation, a sufficient number of uniformly spaced beet seedlings in the field to leave the desired number after the thinning operation without excessive clumps. Such a stand can be achieved in most cases by planting seeds from ½ inch to 1¼ inches deep and spacing them between 1 and 2 inch intervals at a uniform rate throughout the field; the distance between seed varying somewhat with the environmental conditions at planting time and those anticipated when the seedlings should emerge.

Weeds and the present lack of an herbicide that will erradicate them without damaging the sugar beet seedling are factors which prevent planting of beet seed to the desired stand.

MONOGERM SEED

Previously, all the seed, whether multigerm or monogerm, has been sized 7/64 to 10/64 inch in diameter. Recent studies on a field scale basis have demonstrated some additional seed spacing advantages by planting monogerm seed sized 7½/64 to 9½/64 inch in diameter with precision type planters. This seed should be planted with the seed plate holes 11/64 inch in diameter and a seed plate thickness of 8/64 inches. Seed that is sized 7½/64 to 9½/64 will be tagged and issued to growers desiring monogerm seed for precision spacing in 1962.



TOP VIEW of recleaned monogerm seed — 6 to 12/64 inch screen fractions.

SIDE VIEW of the same seeds, showing the tendency toward flatness.

TOP VIEW of processed monogerm seed — 7½ to 9½/64 inch screen fractions.

SIDE VIEW of the same seeds—the flat characteristic calls for a planter plate 8/64 inch thick to prevent multiple cell fill.

67

THESE ARE ACTUAL photographic silhouettes, about 4 times normal size. (The vertical lines are actually 1/64 inch apart). By planting this processed monogerm seed with planters having 11/64 inch holes in plates 8/64 inch thick, maximum uniformity of spacing is achieved.

WHAT DOES A THINNING MACHINE REALLY DO?

By AUSTIN ARMER
Agricultural Engineer, Spreckels Sugar Company

IF THE TITLE of this article were "What Will a Thinning Machine NOT Do?", it would be very much easier to answer the question. In that case, the answer would be: "A thinning machine does not do a skillful, intelligent job of thinning and singling a row of sugar beets as was once done by highly skilled and conscientious hand crews". An approximate answer to the question in the title would be: "A thinning machine really does, in many cases, as good a job of spacing and singling sugar beet plants as an average present day unskilled hand crew".

This latter answer is somewhat inaccurate, and only qualitative. Therefore, let us be a little more specific as to what a thinning machine can do, and set down some pertinent facts, as follows:

1. All down-the-row machines are blockers, which remove blocks of soil of more or less uniform width at more or less uniform intervals.
2. Cross cultivators remove bands of soil across the row at fixed intervals, and these bands contain more or less uniform numbers of plants.
3. Spring tine harrows, used across the rows or to an angle to the rows, are random thinning devices which remove a more or less fixed percentage of all plants, but with no regard to uniformity or spacing.

It should be emphasized at this point that down-the row blocking machines are for the most part devices which chop out uniformly spaced portions of the *soil* in the beet row, accidentally carrying with these "divots" whatever beet or weed plants may be present. In contrast, the spring tine harrow tends to not only sweep out grooves along the surface of the soil, but to entangle individual plants (sugar beets or weeds) and pull them out by the roots.

BLOCKING VS. THINNING

As previously mentioned, all down-the-row thinning machines, as well as cross cultivators, are in fact blocking machines. The size of the beet-containing blocks remaining after such a machine passes over the field, as well as the distance between these blocks, varies a great deal between individual makes of machine and between particular settings of any particular machine.

There is a very prevalent, yet mistaken idea, that a blocking machine leaving a block every ten to twelve inches, is the ideal thinning machine. The fallacy of this concept is that no pre-thinning stand is so uniform that wherever a small block is left, there will be a single beet plant within that block. Because this is a purely imaginary situation, almost never duplicated under field conditions, the practical approach to the mechanical thinning problem has been to leave two or three small blocks in every 10 or 12 inch distance. The reasoning behind this practice is that the chance of leaving a beet-containing block in every 10 or 12 inch space is doubled if two blocks are left, and tripled if three blocks are left. That is why nearly every down-the-row thinning machine or cross cultivator now on the market has a block spacing considerably less than 10 inches—the range being from 3½ inches (Eversman and Silver) to 6¾ inches (Marvin Landplane Company).

It is noteworthy that every manufacturer of down-the-row thinning (blocking) machines has provided a continuous range of adjustments for block width. In other words, the percentage of each block that is removed is continuously adjustable from a maximum to a minimum.

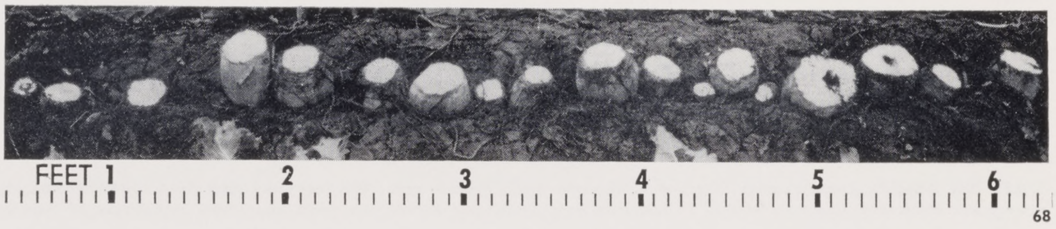
In the case of cross cultivators, the width of the cut is fixed by the width of the cutter knife—the remaining block width between the cuts is, however adjustable.

Following is table II which compares the leading down-the-row thinners in terms of frequency of cut, width of cut and remaining block, and percent row removal.

TABLE II

MAKE OF THINNER	FREQUENCY OF CUT	WIDTH OF CUT		WIDTH OF REMAINING BLOCK		PERCENT ROW REMOVAL	
		MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM
Blackwelder	5.5″	3.8″	1.6″	3.9″	1.7″	70%	30%
Eversman	1.25″ to 10.5″	8.7″	0.3″	10.2″	0	83%	25%
Marvin	6.75″	5.0″	1.0″	5.75″	1.75″	74%	15%
Silver	3.5″	2.6″	1.3″	2.2″	0.9″	75%	37%

TOO MANY BEETS will result if:
1.) The pre-thinning stand is too heavy.
2.) Percent row removal is too low.
3.) The cut is too shallow to completely destroy unwanted seedlings.



NEW GENERAL PURPOSE SLED

THE JOHNSON Farm Machinery Company of Davis has, over the past several years, done considerable development work on sleds upon which planters and cultivators for row crows may be mounted. This development period has culminated in the "Plantivator".

In contrast to a number of other sleds of the same general design, the Plantivator is short and light. The result is that it is extremely maneuverable on headlands and is low in draft.

For planting, the Plantivator is equipped with bed-shapers, and accommodates any of the standard single unit planters such as International, John Deere, Planet Jr., or Milton.

Because the Plantivator is constructed without a rear cross member, the space back of the tool bars is open and will provide no interference for the mounting of thinning units of any standard make.

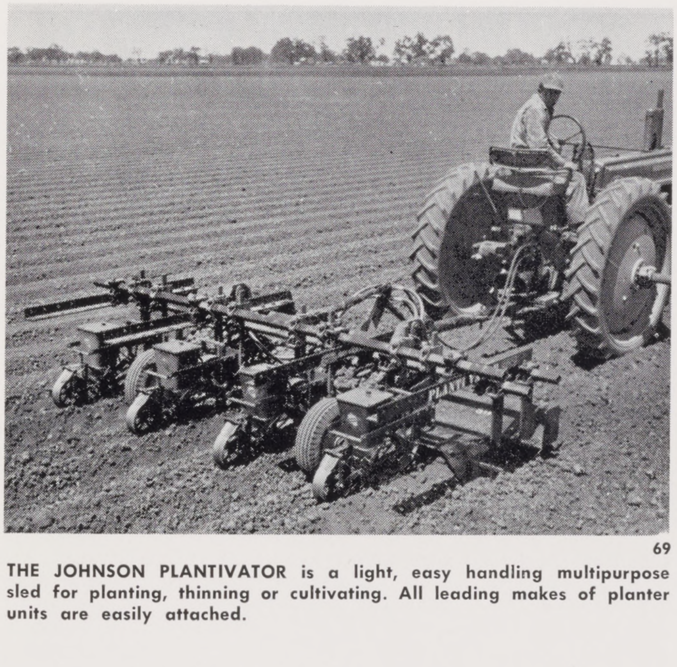
When cultivating time arrives, the tool bar arrangement is ample and convenient for the mounting of conventional cultivator tools.

Brackets are provided for attaching Silver or Eversman thinner units, and other makes should be readily adaptable.

Furrow width is adjustable from 28" to 44". Thus the sugar beet grower may plant on single beds down to 28" spacing, or on double beds up to 44" spacing. For direct seeding of tomatoes, alternate bed shaping covers are removed.

The bed shaping covers are so designed as to permit bed forming without prior listing, provided the soil is mellow and well disked.

The Johnson sled, without attachments, weighs 1100 pounds.



69

THE JOHNSON PLANTIVATOR is a light, easy handling multipurpose sled for planting, thinning or cultivating. All leading makes of planter units are easily attached.

NEW BEET THINNER ANNOUNCED

MR. ROWLAND HORNBOSTEL, Sales Manager of the Marvin Landplane Company at Woodland, announces that his company is now in production on a toolbar-mounted beet thinner which embodies a number of new and desirable features.

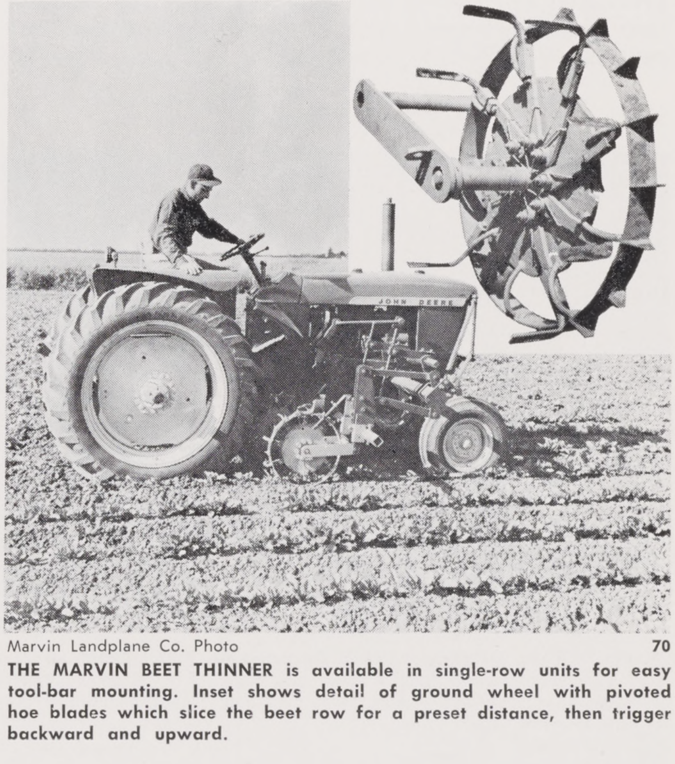
The principle of operation of the Marvin Thinning Machine involves a wheel, ground driven with 18 grouser lugs. Linked to this ground wheel are 9 hoe blades of forged plow steel. The linkage which attaches them to the constantly rotating ground wheel is a clever device which causes each hoe blade to be drawn through the ground at the forward speed of the tractor for a predetermined distance. At the termination of this stroke, a trigger mechanism releases the spring loaded blade and it backs up and out of the way as it lifts from the row.

This unusual linkage presents the hoe blade to the beet row exactly at right angles and because of the rapid backward withdrawal of the blade, remaining plants are virtually undisturbed.

The units are sold separately, so that a purchaser may acquire as many units as he wishes to thin with one pass of the tractor. A tool bar, mounted in front, rear or center of the tractor will accommodate from one to 6 units.

Recommended tractor speed is three miles per hour, and because each unit is ground driven, there is no need for power take-off transmission devices.

The hoe blades are adjustable both for depth of cut (from 1/4 to 1 inch) and for length of cut. The length of cut is adjustable from one to five inches of removal for each 6¾ inches of row.



Marvin Landplane Co. Photo 70

THE MARVIN BEET THINNER is available in single-row units for easy tool-bar mounting. Inset shows detail of ground wheel with pivoted hoe blades which slice the beet row for a preset distance, then trigger backward and upward.

4-H SUGAR BEET PROJECT

SUGAR BEETS, their growth, processing, and the consumption of the product, was the subject of the 4-H Club Sugar Beet Field Days held at Manteca and Woodland recently.

This event, which has become an annual outing for many 4-H Clubbers throughout the central San Joaquin and Sacramento Valleys, was a day of recognition and reward for the effort these boys and girls have put forth in growing a backyard plot of sugar beets.

The days' activities were under the direction of the University of California Extension Service and Spreckels Sugar Company personnel.

The some-300 4-H Club members, their parents and leaders who attended these events were guests of the Spreckels Sugar Company at the Manteca and Woodland factories.

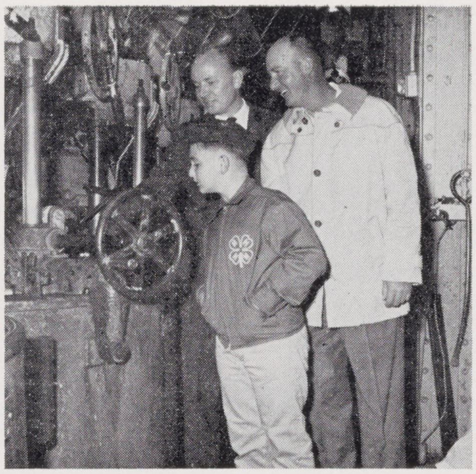
The activities at each event included a tour of the company's factory, a luncheon, and the awarding of sugar to the youngsters from the plots which they had grown. In addition, those who attended the Manteca Field Day heard Dr. Robert S. Loomis, Assistant Professor of Agronomy of the University of California at Davis, talk to them about how research has been used to increase the production of this crop on California's farms.

These boys and girls, some 115 in number, came from San Joaquin, Stanislaus, Merced, Fresno, Solano and Yolo counties. Each had conducted a sugar beet project during the year. During this time they had learned how the beets were planted and grown. The products of these plots were harvested and processed by Spreckels. The program was divided into first and second year projects. During the first year the 4-H Club member plants and cares for 150 square feet of sugar beets. During the second year the project is expanded to 450 square feet of area and a simple fertilizer trial is conducted. The boys and girls in turn, receive at the Field Day the sugar produced from their project.

Extension Service personnel and sugar company representatives, who attended these functions, were most encouraged by the popularity that this project has enjoyed. They pointed out that this was one of the most successful field crop programs offered to 4-H Club members. They stated that it enables the boy or girl, who may not be able to have the more popular projects, such as having a calf or other animal, or who does not have the land available for commercial plantings of field crops, to learn something of how one of California's larger field crops is grown.

Woodland Democrat Photo 71

DARSIE BROUGHTON of Dixon and JOHN CRISTE of Yolo were top sugar producers in Solano and Yolo Counties. They were presented engraved silver sugar bowls by Loyd Stovall, Spreckels livestock specialist.



Loyd Stovall Photos 72

SPRECKELS FIELD SUPERINTENDENTS Moeller and Hull visit the Manteca beet storage pile with Allen Beck of Stanislaus County and Ples Due of San Joaquin County.

KEN MEBOLI, San Joaquin 4-H Clubber and his 4-H leader Jack Jones were conducted on a Manteca Factory tour by Superintendent John Cooley.

DON ELLIOT (center) of Merced, received the sugar he produced from Field Superintendent Bill Hurley and his 4-H leader, Tak Date.

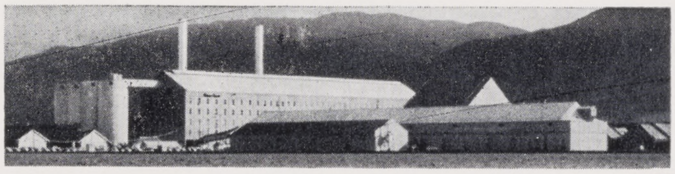
CALIFORNIA WEED CONFERENCE AT SAN JOSE, JANUARY 23-25

AN ANNUAL EVENT of interest to all sugar beet growers is the California Weed Conference. The 1962 meeting will be held at the Hotel Sainte Claire at San Jose, January 23, 24 and 25. The Conference starts at noon, Tuesday, and ends at noon, Thursday.

The Conference is open to the public and will feature a series of talks by leading authorities on weed control in agricultural crops. Related topics will be discussed, including application problems and the legal aspects of weed control—subjects of special interest to sugar beet growers.

Perhaps one of the most interesting items on the program is an evening session covering the general subjects of "what's new in weed control." This symposium will give the audience a look into the future and should provide some constructive ideas for eventual solutions of the problem which costs California agricultural a third of a billion dollars annually, and which costs sugar beet growers 25% of their total production costs.

The January meeting will be the fourteenth annual California Weed Control Conference. The fact that experts have jointed to discuss the problem of weed control for 14 consecutive years is evidence of the importance of the subject to all of California agriculture.



73

CALIFORNIA IRRIGATION INSTITUTE MEETING AT FRESNO, JANUARY 26

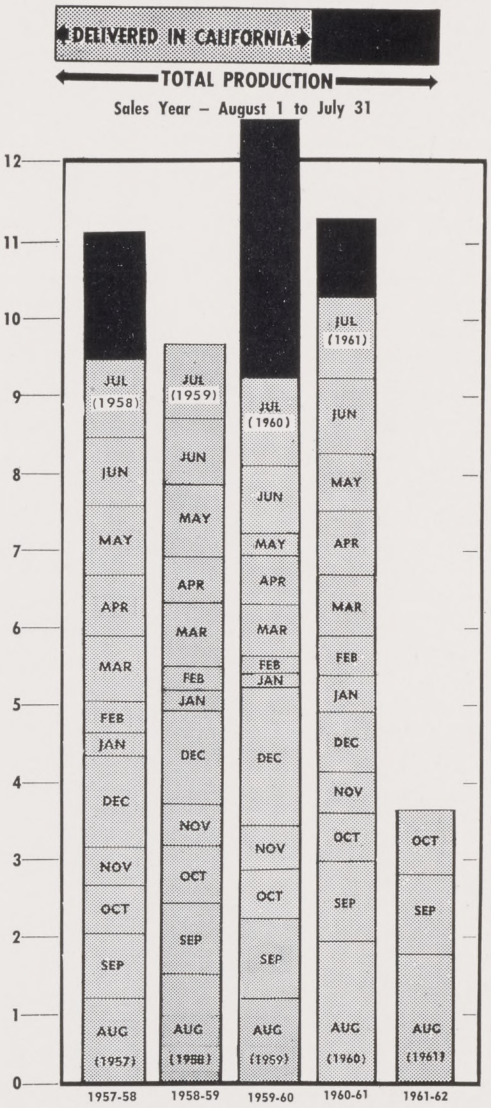
DR. WINSTON C. STRONG, Fresno State College, will be program chairman for a one-day meeting of the California Irrigation Institute to be held at Fresno State College on January 26.

The program will consist of reports from irrigation research and Extension specialists on specific crops. This year's meeting will be concerned with detailed reports on irrigation studies on alfalfa, cotton and sugar beets. Other crops will include grapes and potatoes.

This meeting should be of special interest to sugar beet growers, particularly to growers in the Central San Joaquin Valley where alfalfa, cotton and sugar beets predominate among the field crops.

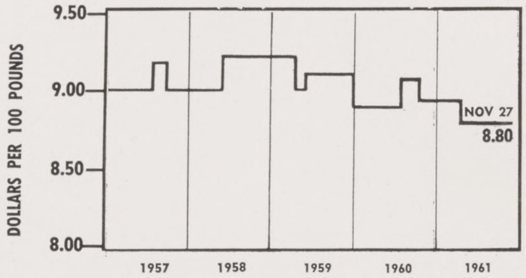
74

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA

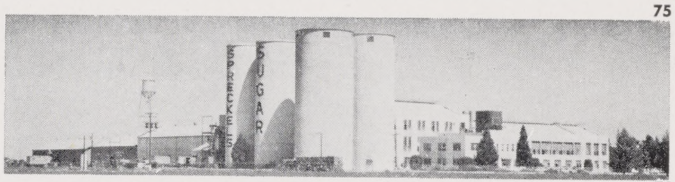


QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



75



76

INDEX TO VOL. 25, 1961

SUBJECT

SEED AND PLANTING

TITLE	AUTHOR	Pages
Beet Seed—Size, Distribution and Stands	George W. Wheatley	42
New General Purpose Sled		45

THINNING AND WEED CONTROL

TITLE	AUTHOR	Pages
Yolo County Success Story	John McDougall	10
Pre-Emergence Weed Control	Harold Voth	11
Some Innovations in Chemical Weed Control	William Duckworth	12
Spring Tine Harrows Widely Accepted	J. W. Hull	14
How Many Beets Should the Thinner Leave?	Lauren Burtch	15
California Weed Conference at San Jose		47
What Does a Thinning Machine Really Do?	Austin Armer	44
New Beet Thinner Announced		45

FERTILIZING AND IRRIGATION

TITLE	AUTHOR	Pages
Higher Quality Sugar Beets	Dr. Varon Jensen	2
Timely and Frequent Irrigation	J. Norman Dawe	18
Start Those Pumps	Dan L. Dieter	19
Practical Irrigation Methods	George W. Wheatley	21
Irrigation Requirements in the San Joaquin Valley	Stanley D. Bayer	22
Rainfall or Irrigation?	John McDougall	23
California Irrigation Institute Meeting		47

DISEASES AND PESTS

TITLE	AUTHOR	Pages
Sugar Beet Nematode Control	John Bryan	15
Another New Area Threatened by Nematode	Bert Lear and W. H. Hart	35
Extension Service Issues Nematode Warning		35

HARVESTING

TITLE	AUTHOR	Pages
Notes From Our Fieldmen		6, 7
Harvester Manufacturers Are Tackling Dirt and Trash	Austin Armer	26
The Cleaner the Better		31

CROP COMMENTS

TITLE	AUTHOR	Pages
A Review of the 1960 Crop	G. D. Manuel	4
The 1960 Honor Roll, District 1		20
The 1960 Honor Roll, Districts 2 and 3		28
Plant Climate Is An Influence on Beet Production	Dr. Varon Jensen	36

COMPANY ITEMS

TITLE	AUTHOR	Pages
Spreckels Agricultural Research Program Expanded		6
Director of Research Position Filled by Dr. R. T. Johnson		23
Factory 4 Under Construction		31
Two New Receiving Stations Will Serve Spreckels Growers		34
Fred Ballou Named Director		34

RESEARCH-EXTENSION-MEETINGS

TITLE	AUTHOR	Pages
Beet Quality Stressed in Industry Meetings		5
Congratulations!		23
Extension Service Issues Nematode Warning		35
Sugar Beet Field Day at U. C. Davis		38
USDA Sugar Scientist		39
Dr. Tysdal's Successor Named		39
4-H Sugar Beet Project		46
California Irrigation Institute Meeting		47
California Weed Control Conference		47

The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers. Mention of specific methods, devices and implements does not constitute an endorsement by the Company. All photographs by the editor unless otherwise indicated.

AUSTIN ARMER, EDITOR
SPRECKELS SUGAR COMPANY
WOODLAND, CALIFORNIA
SPC - DAVIS

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